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Zur Erklärung der Zweibuchstaben-Codes und der anderen Ab-
kürzungen wird auf die Erklärungen ("Guidance Notes on Co-
des and Abbreviations") am Anfang jeder regulären Ausgabe der
PCT-Gazette verwiesen.



Gesellschaft für Biotechnologische Forschung mbH

Tubulysin-Biosynthese-Gene

Tubulysine sind bereits als eine neue, auf das Tubulin-Skelett wirkende Substanzfamilie aus Myxobakterien in Irsee vorgestellt worden; vgl. PCT/EP 97/05095 und DE 100 08 089.8 und die darin angeführte Literatur. Im Gegensatz zu den Epothilonen zeigen diese eine mikrotubuli-abbauende Wirkung sowie die vermehrte Ausbildung von Zentrosomen. Mit einer Cytotoxizität von $IC_{50} = 10 - 500$ pg sind die Tubulysine als potentielle Cytostatika von besonderem Interesse.

Die Tubulysine haben eine cytostatische oder antimitotische Wirkung auf Pilze, humane Tumore oder Krebszelllinien und andere tierische Zellkulturen (vgl. Tabelle). Sie führen in den Zellen zu einem raschen Abbau des Mikrotubuli-Gerüsts. Das Aktinskelett bleibt erhalten. Adhärent wachsende L929-Maus-Zellen vergrößern unter dem Einfluß der Tubulysine ihr Zellvolumen, ohne sich zu teilen, und entwickeln große Zellkerne, die dann in einem apoptischen Vorgang zerfallen.

Wirkunsspektrum

<u>Pilze</u>	<u>Hemmhof [mm]</u>	
	<u>Tubulysin A</u>	<u>Tubulysin B</u>
<i>Aspergillus niger</i>	20	18
<i>Botrytis cineria</i>	23	18
<i>Coprinus cinereus</i>	20	
<i>Pythium debaryanum</i>	20	

Agardiffusionstest: 20 µg pro Testblättchen 6 mm Durchmesser

<u>Humane Krebszellinien</u>	<u>IC₅₀ [ng/ml]</u>		
	<u>Tubulysin A</u>	<u>Tubulysin B</u>	<u>Tubulysin C</u>
KB-3-1 (DSM ACC 158)	0,01	0,02	0,1
K-562 (ATCC CCL 243)	0,1	0,2	1,5
HL-60 (ATCC-CCL 240)	0,04	0,08	0,4

<u>Tierische Zelllinien</u>			
L929, Maus (ATCC CCL1)	0,2	0,4	2
Pt K2, <i>Potorous tri-</i> <i>dactylis</i> (ATCC CCL 56)	0,2	0,2	2

Gemäß einer Ausführungsform betrifft die Erfindung ein ss-DNA-Molekül, ausgewählt aus der folgenden Gruppe:

- (i) ss-DNA-Molekül mit einer Sequenz gemäß Figur 1;
- (ii) ss-DNA-Molekül, das mit einem ss-DNA-Molekül gemäß (i) hinsichtlich seiner Nucleotid-Anzahl oder seiner Nucleotid-Sequenz zu jeweils 90, 91, 92, 93, 94, 95, 96, 97, 98, 99 oder 100% homolog ist, jedoch von dem ss-DNA-Molekül gemäß (i) hinsichtlich seiner Nucleotid-Anzahl und/oder seiner Nucleotid-Sequenz in mindestens einem Nucleotid abweicht; und
- (iii) ss-DNA-Molekül mit einer Sequenz, die zur Sequenz eines ss-DNA-Moleküls gemäß (i) oder (ii) komplementär ist.

Ferner betrifft die Erfindung ein ds-DNA-Molekül aus einem erfindungsgemäßen ss-DNA-Molekül und einem dazu komplementären Strang.

Gemäß einer weiteren Ausführungsform betrifft die Erfindung ein ss-DNA-Molekül, ausgewählt aus der folgenden Gruppe:

- (i) ss-DNA-Molekül mit einer Sequenz der Positionen 3.308 bis 1 (ORF 16) der Sequenz gemäß Figur 1;
- (ii) ss-DNA-Molekül mit einer Sequenz der Positionen 4706 bis 3453 (ORF 15) der Sequenz gemäß Figur 1;
- (iii) ss-DNA-Molekül mit einer Sequenz der Positionen 5719 bis 7164 (ORF 14) der Sequenz gemäß Figur 1;

- (iv) ss-DNA-Molekül mit einer Sequenz der Positionen 9557 bis 7317 (ORF 13) der Sequenz gemäß Figur 1;
- (v) ss-DNA-Molekül mit einer Sequenz der Positionen 12193 bis 10550 (ORF 12) der Sequenz gemäß Figur 1;
- (vi) ss-DNA-Molekül mit einer Sequenz der Positionen 12841 bis 13881 (ORF 11) der Sequenz gemäß Figur 1;
- (vii) ss-DNA-Molekül mit einer Sequenz der Positionen 14833 bis 13835 (ORF 10) der Sequenz gemäß Figur 1;
- (viii) ss-DNA-Molekül mit einer Sequenz der Positionen 14942 bis 15586 (ORF 9) der Sequenz gemäß Figur 1;
- (ix) ss-DNA-Molekül mit einer Sequenz der Positionen 15847 bis 16983 (ORF 8) der Sequenz gemäß Figur 1;
- (x) ss-DNA-Molekül mit einer Sequenz der Positionen 21154 bis 18809 (ORF 7) der Sequenz gemäß Figur 1;
- (xi) ss-DNA-Molekül mit einer Sequenz der Positionen 22366 bis 23532 (ORF 6) der Sequenz gemäß Figur 1;
- (xii) ss-DNA-Molekül mit einer Sequenz der Positionen 24591 bis 26513 (ORF 5) der Sequenz gemäß Figur 1;
- (xiii) ss-DNA-Molekül mit einer Sequenz der Positionen 26597 bis 27517 (ORF 4) der Sequenz gemäß Figur 1;

- (xiv) ss-DNA-Molekül mit einer Sequenz der Positionen 29858 bis 30400 (ORF 3) der Sequenz gemäß Figur 1;
- (xv) ss-DNA-Molekül mit einer Sequenz der Positionen 31220 bis 32392 (TubA) der Sequenz gemäß Figur 1;
- (xvi) ss-DNA-Molekül mit einer Sequenz der Positionen 33056 bis 32397 (ORF 2) der Sequenz gemäß Figur 1;
- (xvii) ss-DNA-Molekül mit einer Sequenz der Positionen 34195 bis 33074 (TubZ) der Sequenz gemäß Figur 1;
- (xviii) ss-DNA-Molekül mit einer Sequenz der Positionen 35422 bis 34205 (ORF 1) der Sequenz gemäß Figur 1;
- (xix) ss-DNA-Molekül mit einer Sequenz der Positionen 35522 bis 40147 (TubB) der Sequenz gemäß Figur 1;
- (xx) ss-DNA-Molekül mit einer Sequenz der Positionen 40144 bis 48021 (TubC) der Sequenz gemäß Figur 1;
- (xxi) ss-DNA-Molekül mit einer Sequenz der Positionen 48011 bis 58558 (TubD) der Sequenz gemäß Figur 1;
- (xxii) ss-DNA-Molekül mit einer Sequenz der Positionen 58551 bis 62096 (TubE) der Sequenz gemäß Figur 1;
- (xxiii) ss-DNA-Molekül mit einer Sequenz der Positionen 62103 bis 70616 (TubF) der Sequenz gemäß Figur 1;
- (xxiv) ss-DNA-Molekül, das mit einem Molekül gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x),

(xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii) oder (xxiii) unter stringenten Bedingungen hybridisierbar ist und insbesondere dieselbe Anzahl von Basen aufweist; und

(xxv) ss-DNA-Molekül, das mit einem ss-DNA-Molekül gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii) oder (xxiii) hinsichtlich seiner Nucleotid-Anzahl oder seiner Nucleotid-Sequenz zu jeweils 90, 91, 92, 93, 94, 95, 96, 97, 98, 99 oder 100% homolog ist, jedoch von diesem ss-DNA-Molekül hinsichtlich seiner Nucleotid-Anzahl und/oder seiner Nucleotid-Sequenz in mindestens einem Nucleotid abweicht; und

(xxvi) ss-DNA-Molekül mit einer Sequenz, die zur Sequenz eines Moleküls gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii), (xxiii), (xxiv) oder (xxv) komplementär ist.

Ferner betrifft die Erfindung ein ds-DNA-Molekül aus einem derartigen erfindungsgemäßen ss-DNA-Molekül und einem dazu komplementären Strang.

Gemäß einer weiteren Ausführungsform betrifft die Erfindung ein ss-DNA-Molekül, ausgewählt aus der folgenden Gruppe:

- (i) ss-DNA-Molekül mit einer Sequenz der Positionen 35747 bis 36769 (Domäne C des tubB-Gens) der Sequenz gemäß Figur 1;
- (ii) ss-DNA-Molekül mit einer Sequenz der Positionen 37184 bis 39817 (Domäne A des tubB-Gens) der Sequenz gemäß Figur 1;
- (iii) ss-DNA-Molekül mit einer Sequenz der Positionen 38369 bis 39730 (Domäne NMT des tubB-Gens) der Sequenz gemäß Figur 1;
- (iv) ss-DNA-Molekül mit einer Sequenz der Positionen 39818 bis 40069 (Domäne PCP des tubB-Gens) der Sequenz gemäß Figur 1;
- (v) ss-DNA-Molekül mit einer Sequenz der Positionen 40372 bis 41397 (Domäne C des tubC-Gens) der Sequenz gemäß Figur 1;
- (vi) ss-DNA-Molekül mit einer Sequenz der Positionen 41824 bis 43215 (Domäne A des tubC-Gens) der Sequenz gemäß Figur 1;
- (vii) ss-DNA-Molekül mit einer Sequenz der Positionen 43216 bis 43461 (Domäne PCP des tubC-Gens) der Sequenz gemäß Figur 1;
- (viii) ss-DNA-Molekül mit einer Sequenz der Positionen 43552 bis 44574 (Domäne C des tubC-Gens) der Sequenz gemäß Figur 1;

- (ix) ss-DNA-Molekül mit einer Sequenz der Positionen 44980 bis 47631 (Domäne A des tubC-Gens) der Sequenz gemäß Figur 1;
- (x) ss-DNA-Molekül mit einer Sequenz der Positionen 46153 bis 47547 (Domäne NMT des tubC-Gens) der Sequenz gemäß Figur 1;
- (xi) ss-DNA-Molekül mit einer Sequenz der Positionen 47632 bis 47868 (Domäne PCP des tubC-Gens) der Sequenz gemäß Figur 1;
- (xii) ss-DNA-Molekül mit einer Sequenz der Positionen 48011 bis 49321 (Domäne KS des tubD-Gens) der Sequenz gemäß Figur 1;
- (xiii) ss-DNA-Molekül mit einer Sequenz der Positionen 49622 bis 50584 (Domäne AT des tubD-Gens) der Sequenz gemäß Figur 1;
- (xiv) ss-DNA-Molekül mit einer Sequenz der Positionen 51473 bis 52309 (Domäne KR des tubD-Gens) der Sequenz gemäß Figur 1;
- (xv) ss-DNA-Molekül mit einer Sequenz der Positionen 53066 bis 53980 (Domäne ER des tubD-Gens) der Sequenz gemäß Figur 1;
- (xvi) ss-DNA-Molekül mit einer Sequenz der Positionen 54158 bis 54460 (Domäne ACP des tubD-Gens) der Sequenz gemäß Figur 1;

- (xvii) ss-DNA-Molekül mit einer Sequenz der Positionen 54461 bis 55870 (Domäne HC des tubD-Gens) der Sequenz gemäß Figur 1;
- (xviii) ss-DNA-Molekül mit einer Sequenz der Positionen 56000 bis 57412 (Domäne A des tubD-Gens) der Sequenz gemäß Figur 1;
- (xix) ss-DNA-Molekül mit einer Sequenz der Positionen 57413 bis 57643 (Domäne PCP des tubD-Gens) der Sequenz gemäß Figur 1;
- (xx) ss-DNA-Molekül mit einer Sequenz der Positionen 58689 bis 59714 (Domäne C des tubE-Gens) der Sequenz gemäß Figur 1;
- (xxi) ss-DNA-Molekül mit einer Sequenz der Positionen 60156 bis 61697 (Domäne A des tubE-Gens) der Sequenz gemäß Figur 1;
- (xxii) ss-DNA-Molekül mit einer Sequenz der Positionen 61698 bis 61967 (Domäne PCP des tubE-Gens) der Sequenz gemäß Figur 1;
- (xxiii) ss-DNA-Molekül mit einer Sequenz der Positionen 62127 bis 63320 (Domäne KS des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxiv) ss-DNA-Molekül mit einer Sequenz der Positionen 63711 bis 64676 (Domäne AT des tubF-Gens) der Sequenz gemäß Figur 1;

- (xxv) ss-DNA-Molekül mit einer Sequenz der Positionen 64959 bis 65882 (Domäne KR des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxvi) ss-DNA-Molekül mit einer Sequenz der Positionen 65985 bis 67061 (Domäne CMT des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxvii) ss-DNA-Molekül mit einer Sequenz der Positionen 67242 bis 67829 (Domäne DH des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxviii) ss-DNA-Molekül mit einer Sequenz der Positionen 68247 bis 69128 (Domäne ER des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxix) ss-DNA-Molekül mit einer Sequenz der Positionen 69360 bis 69605 (Domäne PCP des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxx) ss-DNA-Molekül mit einer Sequenz der Positionen 69759 bis 70586 (Domäne TE des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxxi) ss-DNA-Molekül, das mit einem Molekül gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xiv), (xx), (xxi), (xxii), (xxiii), (xxiv), (xxv), (xxvi), (xxvii), (xxviii), (xxix) oder (xxx) unter stringenten Bedingungen hybridisierbar ist und insbesondere dieselbe Anzahl von Basen aufweist;

(xxxii) ss-DNA-Molekül, das mit einem Molekül gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xiv), (xx), (xxi), (xxii), (xxiii), (xxiv), (xxv), (xxvi), (xxvii), (xxviii), (xxix) oder (xxx) hinsichtlich seiner Nucleotid-Anzahl oder seiner Nucleotid-Sequenz zur jeweils 90, 91, 92, 93, 94, 95, 96, 97, 98, 99 oder 100% homolog ist, jedoch von diesem ss-DNA-Molekül hinsichtlich seiner Nucleotid-Anzahl und/oder seiner Nucleotid-Sequenz in mindestens einem Nucleotid abweicht; und

(xxxiii) ss-DNA-Molekül mit einer Sequenz, die zur Sequenz eines Moleküls gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xiv), (xx), (xxi), (xxii), (xxiii), (xxiv), (xxv), (xxvi), (xxvii), (xxviii), (xxix), (xxx), (xxxi) oder (xxxii) komplementär ist.

Ferner betrifft die Erfindung ein ds-DNA Molekül aus einem derartigen ss-DNA-Molekül und einem dazu komplementärem Strang.

Ferner betrifft die Erfindung Varianten oder Mutanten, die aus einer Substitution, Insertion oder Deletion von Nucleotiden oder einer Inversion von Nucleotid-Segmenten eines erfindungsgemäßen ss-DNA-Moleküls oder eines erfindungsgemäßen ds-DNA-Moleküls resultieren, wobei diese Varianten und Mutanten Enzym-Varianten oder Enzym-Mutanten für die Produktion von Sekundärstoff(en) mit den eingangs geschilderten und für Tubulysine charakteristischen Eigenschaften codieren, insbesondere mit der cytostatischen Wirkung. Der Fachmann ist mit Massenscreening vertraut.

Ferner betrifft die Erfindung RNA

- (a) mit einer Sequenz entsprechend der eines erfindungsgemäßen ss-DNA-Moleküls oder
 - (b) mit einer Sequenz einer RNA gemäß (a), aber in Gegenrichtung (anti-sense), oder
 - (c) mit einer Sequenz einer RNA gemäß (a) oder (b) und mit einem dazu komplementären Strang,
- jeweils gegebenenfalls als Element eines rekombinanten Vektors.

Gemäß einer weiteren Ausführungsform betrifft die Erfindung einen rekombinanten Vektor, insbesondere Expressionsvektor mit einem erfindungsgemäßen DNA-Molekül.

Gemäß einer weiteren Ausführungsform betrifft die Erfindung eine Zelle, insbesondere zur Expression, in die ein erfindungsgemäßes DNA-Molekül oder ein erfindungsgemäßer Vektor integriert ist.

Die erfindungsgemäße Zelle kann sich von kultivierbaren Bakterien wie Myxobakterien wie Angiococcus, insbesondere A. disciformis, Archangium, insbesondere A. gephyra, Escherichia coli, Pseudomonaden oder Actinomyceten herleiten.

Gemäß einer weiteren Ausführungsform betrifft die Erfindung eine Verwendung eines erfindungsgemäßen Vektors für die Transformation von Zellen oder Organismen zur transienten oder permanenten Expression eines oder mehrerer Proteine (Expressionsprodukt(e)), das (die) durch eine DNA (ssDNA oder dsDNA) des Vektors codiert wird (werden).

Gemäß einer weiteren Ausführungsform betrifft die Erfindung eine Verwendung einer erfindungsgemäßen Zelle zur enzymatischen

Biosynthese, Mutasynthese oder Partial-Synthese eines Tubulysins, insbesondere Tubulysin A, B, C, D, E und/oder F.

Gemäß einer weiteren Ausführungsform betrifft die Erfindung ein Expressionsprodukt eines erfindungsgemäßen DNA-Moleküls oder eines erfindungsgemäßen Vektors oder einer erfindungsgemäßen Zelle.

Die vorliegende Erfindung betrifft insbesondere ein Polynucleotid, das eine Sequenz wie in SEQ ID NO: 1, 18, 33 oder 36 definiert, oder ein Fragment davon enthält. SEQ ID NO: 1 und 18 beschreiben den (+)- bzw. den (-)-Strang des Tubulysin Biosynthese-Clusters von *Angiococcus disciformis*. SEQ ID NO: 33 ist eine Sequenz, die mehrere sich überlappende Gene des Clusters enthält. SEQ ID NO: 36 beschreibt eine Mutante von *Angiococcus disciformis*. Überraschenderweise wurde gefunden, dass diese Mutante ein Vielfaches der Tubulysin D-Produktion des Wildtyps zeigte. Die Tubulysin-Überexpression ist auf die Gesamtwirkung aller Tubulysin-Derivate bezogen sogar noch höher als die von Tubulysin D, was in keinsterweise zu erwarten war. Die Gene der SEQ ID NO: 36 sind offenbar an der negativen Regulation der Tubulysin Expression beteiligt. Diese Mutante ist auf Grund der erhöhten Expression aller Tubulysine besonders geeignet zur Produktion der erfindungsgemäßen Polypeptide. Antikörper gegen die Wildtyp-Expressionsprodukte dieser Sequenz können eingesetzt werden, um deren negativen Einfluss auf die Tubulysin Produktion auch in anderen Stämmen zu minimieren. Einen ähnlichen Effekt haben auch antisense-RNA bzw RNAi-Techniken, die mit der Wildtyp Sequenz der negativen Regulatorgene interagieren.

Die Fragmente des Polynucleotid können jede beliebige Teilsequenz und Länge haben, bevorzugt sind jedoch solche Fragmente, die Proteine codieren. Die Polynucleotide der vorliegenden Erfindung schließen ebenfalls ein, sind jedoch nicht beschränkt auf, ein Polynucleotid, das an den komplementären Strang der offenbaren Nucleotidsequenzen unter moderat stringenten oder stringenten Bedingungen hybridisiert; ein Polynucleotid, das eine Allel-Variante irgendeines oben beschriebenen Polynucleotids ist; ein Polynucleotid, das ein Spezies-Homolog irgendwelcher der hier offenbaren Proteine codiert; oder ein Polynucleotid, das ein Polypeptid codiert, das eine zusätzliche spezifische Domäne oder eine Trunkierung bzw. Verkürzung der offenbaren Proteine aufweist.

Der Begriff "CDS" bezeichnet eine Sequenz von Nucleotiden, die der Sequenz von Aminosäuren in einem Protein entspricht, also die Aminosäuren-codierenden Sequenzbereiche, inklusive des jeweiligen Start- und Stoppcodons.

In einer bevorzugten Ausführungsform ist das erfindungsgemäße Polynucleotid ein Fragment, das eine im Sequenzprotokoll definierte CDS ist.

Die vorliegende Erfindung betrifft weiterhin einen Vektor, der ein Polynucleotid wie oben beschrieben enthält. Vektoren für verschiedene Zwecke sind im Stand der Technik bekannt, ebenso die Techniken zur Subklonierung von Polynucleotiden in solche Vektoren. Diese werden beispielsweise in der neuen Ausgabe von Molecular Cloning: A Laboratory Manual, (Sambrook et al., (1989) Molecular Cloning: A Laboratory Manual, 2nd ed., Cold Spring Harbor Laboratory Press); DNA Cloning, Volumes I and II (D. N. Glover ed., 1985); Gene Transfer Vectors for Mammalian Cells

(Miller & Calos, eds.); Current Protocols in Molecular Biology and Short Protocols in Molecular Biology, 3rd Edition (F. M. Ausubel et al., eds.); Recombinant DNA Methodology (R. Wu ed., Academic Press) oder "A Practical Guide To Molecular Cloning" beschrieben. Beispiele für Vektoren finden sich unter anderen in Gene Transfer Vectors For Mammalian Cells (J. H. Miller and M. P. Calos eds., 1987, Cold Spring Harbor Laboratory).

Bei dem Vektor handelt es sich vorzugsweise um einen Expressionsvektor, also im Allgemeinen ein Plasmid, einen Phagen, ein Virus oder einen Vektor zum Exprimieren eines Polypeptids aus einer DNA (RNA) Sequenz. Ein Expressionsvektor kann eine Transkriptionseinheit umfassen, die eine Anordnung des Folgenden aufweist: (1) ein genetisches Element oder Elemente mit einer regulatorischen Rolle in der Genexpression, beispielsweise Promotoren oder Enhancer, (2) eine Struktursequenz oder codierende Sequenz, die in mRNA transkribiert und in ein Protein translatiert wird und (3) geeignete Transkriptionsstart- und -terminationssequenzen. Struktureinheiten, die zur Verwendung in Hefen oder eukaryontischen Expressionssystemen vorgesehen sind, schließen vorzugsweise eine Leadersequenz ein, die die extrazelluläre Sekretion eines translatierten Proteins durch einen Wirt ermöglicht. Es kann alternativ, wenn ein rekombinantes Protein ohne eine Leader- oder Transportsequenz exprimiert wird, einen N-terminalen Methionin-Rest einschließen. Dieser Rest kann, muss aber nicht anschließend von dem exprimierten rekombinanten Protein abgespalten werden, um das Endprodukt zu erhalten.

Des Weiteren betrifft die vorliegende Erfindung eine Zelle, die einen solchen Vektor enthält. Der Vektor kann über die bekannten Techniken wie beispielsweise Transfektion, Elektroporation,

Lipofektion usw. in die Zelle eingebracht werden. Bei viralen Vektoren ist auch eine Infektion möglich. Bei den Zellen kann es sich um eukaryotische als auch prokaryotische Zellen handeln. Auch die Methoden zur Selektion und Propagierung der Zellen, die den Vektor enthalten sind dem Fachmann bekannt. Beispiele für die Kultivierung von Zellen tierischen Ursprungs sind u.a. in Culture Of Animal Cells (R. I. Freshney, Alan R. Liss, Inc., 1987) zu finden.

Eine weitere Ausführungsform betrifft ein Polypeptid, das wenigstens eine Sequenz wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder ein Fragment und/oder Derivat davon enthält. Das Polypeptid kann sowohl durch Expression eines Polynucleotids als auch durch chemische Synthese bereitgestellt werden.

Die Aminosäuresequenzen der vorliegenden Erfindung umfassen ebenfalls alle Sequenzen, die sich von den hier offenbarten Sequenzen durch Aminosäureinsertionen, -deletionen und -substitutionen unterscheiden.

Aminosäure- „Substitutionen“ sind vorzugsweise das Ergebnis des Ersetzens einer Aminosäure durch eine andere Aminosäure mit ähnlichen strukturellen und/oder chemischen Eigenschaften, das heißt konservative Aminosäure-Austausche. Aminosäure-Substitutionen können auf der Grundlage einer Ähnlichkeit in der Polarität, Ladung, Löslichkeit, Hydrophobie, Hydrophilie und/oder der amphipatischen Natur der einbezogenen Reste vorgenommen werden. Beispielsweise schließen unpolare (hydrophobe) Aminosäuren Alanin, Leucin, Isoleucin, Valin, Prolin, Phenylalanin, Tryptophan und Methionin ein; polare neutrale Aminosäuren schließen Glycin, Serin, Threonin, Cystein,

Tyrosin, Asparagin und Glutamin ein; positiv geladene (basische) Aminosäuren schließen Arginin, Lysin und Histidin ein; und negativ geladene (saure) Aminosäuren schließen Asparaginsäure und Glutaminsäure ein.

"Insertionen" oder "Deletionen" bewegen sich typischerweise im Bereich von 1-3 Aminosäuren. Die erlaubte Variation kann experimentell bestimmt werden, indem systematisch Insertionen, Deletionen oder Substitutionen von Aminosäuren in einem Polypeptidmolekül unter Verwendung von DNA-Rekombinationstechniken vorgenommen und die sich ergebenden rekombinanten Varianten bezüglich ihrer Aktivität untersucht werden. Dazu ist für den Fachmann nicht mehr als die Durchführung von Routineexperimenten erforderlich.

Beispielsweise kann das Polypeptid auch in Form eines chimären Polypeptids, codiert durch ein Fusionsgens, vorliegen, dass wenigstens eine weitere Sequenz enthält. Diese zusätzliche Sequenz kann z.B. dazu dienen, die Aufreinigung des Expressionsprodukts zu erleichtern oder dem Expressionsprodukt eine zusätzlich Funktion zu verleihen.

Beispiele für zusätzliche Sequenzen, die die Aufreinigung erleichtern sind sogenannte Tags, die dem Fachmann bekannt sind, wie z.B. das his-tag.

Die vorliegende Erfindung betrifft außerdem die Verwendung wenigstens eines Polynucleotids wie in SEQ ID NO: 1, 18, 33 und/oder 36 definiert und/oder wenigstens eines Fragments davon und/oder wenigstens eines Polypeptids wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder wenigstens eines Fragments davon zur Herstellung einer pharmazeutischen Zusammensetzung zur Behandlung von

unerwünschtem Zellwachstums oder unerwünschter Zellvermehrung in einem Individuum. Die Zusammensetzung kann beispielsweise einen geeigneten Vektor enthalten, zusammen mit Hilfsfaktoren, die die Expression eines Tubulysins, vorzugsweise in den unerwünschten Zellen, ermöglichen und dadurch ein weiteres Wachstum bzw. eine weitere Vermehrung dieser Zellen verhindern. Die Zusammensetzung kann auch erfindungsgemäße Zellen enthalten, die mit einem Vektor, beispielsweise einen Tubulysin-exprimierenden Vektor, transfiziert wurden.

In einer bevorzugten Ausführungsform ist das unerwünschte Zellwachstum oder die unerwünschte Zellvermehrung ein Tumor. Der Tumor kann sowohl eine gutartige als auch eine bösartige Geschwulst sein.

In einer weiteren Ausführungsform ist das unerwünschte Zellwachstum eine pathogene Infektion. Das Pathogen kann hierbei sowohl einzellig als auch mehrzellig sein. Dies schließt auch Infektionen mit Pilzen, wie beispielsweise Candida oder Aspergillus, und Infektionen mit Parasiten, wie beispielsweise Trypanosomen oder Schistosomen ein. In einer bevorzugten Ausführungsform der Verwendung ist die pathogene Infektion eine Mykose, Malaria oder eine parasitäre Erkrankung.

Die Erfindung betrifft ferner eine pharmazeutische Zusammensetzung, enthaltend wenigstens ein Polynucleotid wie in SEQ ID NO: 1, 18, 33 und/oder 36 definiert und/oder wenigstens ein Fragment davon und/oder wenigstens ein Polypeptid wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder wenigstens ein Fragment davon. Die Zusammensetzungen enthalten eine therapeutisch wirksame Menge bzw. Dosis des jeweiligen Wirk- bzw. Inhaltsstoffes. Eine therapeutisch

wirksame Dosis betrifft diejenige Menge der Verbindung, die ausreicht, um eine Linderung der Symptome, beispielsweise eine Behandlung, Heilung, Prävention oder Linderung derartiger Zustände, insbesondere die Hemmung oder Verhinderung von unerwünschtem Zellwachstum und Zellvermehrung in einem Patienten zu ergeben. Geeignete Verabreichungswege schließen beispielsweise eine parenterale Verabreichung, einschließlich intramuskulärer und subkutaner Injektionen, ebenso wie intrathekaler, direkt intraventrikulärer, intravenöser, intraperitonealer Injektionen ein.

In einer weiteren Ausführungsform enthält diese pharmazeutische Zusammensetzung wenigstens einen pharmazeutisch verträglichen Trägerstoff. Eine solche Zusammensetzung kann weiterhin (zusätzlich zum Inhaltsstoff und dem Träger) Verdünnungsmittel, Füllmittel, Salze, Puffer, Stabilisatoren, Lösungsvermittler und andere Materialien enthalten, die im Stand der Technik wohl bekannt sind. Der Begriff "pharmazeutisch verträglich" bedeutet ein nicht-toxisches Material, das die Wirksamkeit der biologischen Aktivität des aktiven Inhaltsstoff (der aktiven Inhaltsstoffe) nicht stört. Die Eigenschaften des Trägers hängen vom Verabreichungsweg ab. Die therapeutische Zusammensetzung kann weiterhin weitere Mittel bzw. Wirkstoffe enthalten, die die Aktivität bzw. Wirksamkeit oder Anwendung bei Behandlung verbessern bzw. erleichtern. Solche zusätzlichen Faktoren und/oder Mittel können in der therapeutischen Zusammensetzung enthalten sein, um eine synergistische Wirkung zu erzeugen oder um Nebenwirkungen zu minimieren.

Techniken zur Formulierung, Zubereitung und Verabreichung der Verbindungen der vorliegenden Erfindung sind in "Remington's

Pharmaceutical Sciences", Mack Publishing Co., Easton, PA, neueste Ausgabe, zu finden.

Die vorliegende Erfindung betrifft außerdem ein Verfahren zur Herstellung von Tubulysinen und Tubulysin-Biosynthese Proteinen, umfassend die Schritte:

- (a) exprimieren von wenigstens einem Polynucleotid wie in SEQ ID NO: 1, 18, 33 und/oder 36 definiert und/oder wenigstens einem Fragment davon und/oder wenigstens einem Polypeptid wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder wenigstens einem Fragment davon, und
- (b) aufreinigen der Expressionsprodukte.

Methoden zur Expression von Proteinen sind dem Fachmann bekannt und können der einschlägigen Literatur entnommen werden, beispielweise aus Methods In Enzymology, Vols. 154 and 155 (Wu et al. eds.) oder Recombinant DNA Methodology (R. Wu ed., Academic Press). Für das Aufreinigen von Expressionsprodukten sind dem Fachmann eine Vielzahl von Methoden bekannt. Neben chromatographischen Methoden wie beispielsweise Affinitätschromatographie oder HPLC können auch immunologische Verfahren wie beispielsweise immobilisierte Antikörper gegen ein Epitop auf dem Expressionsprodukt, z.B. einem His-tag, zum Aufreinigen der Produkte verwendet werden.

In einer bevorzugten Ausführungsform erfolgt die Expression in prokaryotischen oder eukaryotischen Zellen und/oder durch in vitro Expression. Die Expression von Polypeptiden in prokaryotischen oder eukaryotischen Zellen ist ein häufig angewandtes Verfahren und wird im Allgemeinen mittels eines Expressionsvektors, wie oben beschrieben, erreicht. Für die in vitro Expression sind ebenfalls bereits Vektoren beschrieben.

Diese und die notwendigen Faktoren sind kommerziell in Form von Kits erhältlich, beispielsweise von BioRad, Stratagene, Invitrogen und Clontech.

Desweiteren stellt die Erfindung ein Verfahren zum Auffinden von Genen, die an der Biosynthese von Tubulysinen beteiligt sind, bereit. Das Verfahren umfasst die folgenden Schritte:

- (a) hybridisieren von wenigstens einem Polynucleotid wie in SEQ ID NO: 1, 18, 33 und/oder 36 definiert und/oder wenigstens einem Fragment davon mit DNA, RNA, und/oder cDNA einer Spezies, die nicht mit *Angiococcus disciformis* identisch ist, und
- (b) isolieren und charakterisieren der hybridisierten DNA, RNA, und/oder cDNA.

Die Hybridisierung kann unter unterschiedlich stringenten Bedingungen durchgeführt werden.

Die Stringenz der Hybridisierung, wie hierin verwendet, betrifft Bedingungen, unter denen Polynucleotid-Doppelstränge stabil sind. Wie dem Fachmann bekannt ist, ist die Stabilität eines Doppelstranges eine Funktion der Natriumionenkonzentration und der Temperatur (siehe beispielsweise Sambrook et al., Molecular Cloning: A Laboratory Manual 2nd Ed. (Cold Spring Harbor Laboratory, (1989)). Die Stringenzniveaus, die zur Hybridisierung verwendet werden, können vom Fachmann leicht abgewandelt werden.

Der Begriff „schwach stringente Hybridisierung“ bezeichnet Bedingungen, die einer Hybridisierung in 10% Formamid, 5 x Denharts Lösung, 6 x SSPE, 0,2 % SDS bei 42°C, gefolgt von Waschen in 1 x SSPE, 0,2 % SDS bei 50°C äquivalent sind.

Denhart's Lösung und SSPE sind dem Fachmann genauso wie andere geeignete Hybridisierungspuffer wohl bekannt.

Eine „moderat stringente Hybridisierung“ bedeutet Bedingungen, die es der DNA erlauben, an eine komplementäre Nucleinsäure zu binden, die ungefähr 60 % Identität, vorzugsweise ungefähr 75 % Identität, besonders bevorzugt ungefähr 85 % Identität zu dieser DNA aufweist; wobei eine Identität von mehr als ungefähr 90 % zu dieser DNA besonders bevorzugt wird. Moderat stringente Bedingungen sind vorzugsweise Bedingungen, die eine Hybridisierung in 50 % Formamid, 5 x Denharts Lösung, 5 x SSPE, 0,2 % SDS bei 42°C gefolgt von Waschen in 0,2 x SSPE, 0,2 % SDS bei 65°C äquivalent sind.

Hochstringente Hybridisierung bedeutet Bedingungen, die die Hybridisierung nur von solchen Nucleinsäuresequenzen ermöglichen, die in 0,018 M NaCl bei 65°C stabile Doppelstränge bilden (d.h., wenn ein Doppelstrang in 0,018 M NaCl bei 65°C nicht stabil ist, ist er unter den hier beschriebenen/definierten hochstringenten Bedingungen nicht stabil).

Weiterhin können Nucleinsäure-Hybridisierungstechniken verwendet werden, um eine Nucleinsäure zu identifizieren und zu gewinnen, die von der vorliegenden Erfindung umfasst ist. Kurz gesagt kann jede Nucleinsäure mit einer gewissen Homologie zu einer in dieser Erfindung offenbarten Sequenz oder einem Fragment davon, als Sonde zur Identifizierung einer ähnlichen Nucleinsäure durch Hybridisierung unter moderat stringenten bis hochstringenten Bedingungen verwendet werden. Solche ähnlichen Nucleinsäuren können dann isoliert, sequenziert und analysiert werden, um zu bestimmen, ob sie von der vorliegenden Erfindung umfasst werden.

Die vorliegende Erfindung stellt außerdem einen Kit zur Herstellung von Tubulysinen, enthaltend:

- (a) wenigstens ein Polynucleotid, enthaltend eine Sequenz wie in SEQ ID NO: 1, 18, 33 oder 36 definiert oder ein Fragment davon und/oder wenigstens einen Vektor der ein solches Polynucleotid enthält oder
- (b) geeignete Medien und Puffer zur Vermehrung von Zellen, die eine Expression des Polynucleotids und/oder Vektors erlauben, und
- (c) geeignete Mittel zum Aufreinigen des/der Expressionsprodukte(s)

bereit.

Auf Grund ihrer Wirkung auf das Tubulin-Skelett und ihrer Cytotoxizität, insbesondere bei Pilzen, eignen sich Tubuline auch als Desinfektionsmittel, das eine Kontamination mit Tubulin-enthaltenden Zellen abbauen bzw. verhindern kann. Die Erfindung betrifft deshalb auch die Verwendung einer Zusammensetzung enthaltend wenigstens ein Polypeptid wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder wenigstens ein biologisch aktives Fragment oder Derivat davon als Desinfektionsmittel. Neben dem oben definierten Polypeptid können im Desinfektionsmittel auch andere desinfizierend wirkende Stoffe enthalten sein, solange sie die Wirkung des erfindungsgemäßen Polypeptids nicht inhibieren. Außerdem kann das Desinfektionsmittel weitere Hilfsstoffe wie beispielsweise Puffer, Wasser, Farbstoffe, Duftstoffe, Stabilisatoren, Trägerstoffe usw. enthalten. In einer bevorzugten Ausführungsform ist die Zusammensetzung flüssig oder pulverförmig.

Entsprechend betrifft die Erfindung auch Desinfektionsmittel wie oben definiert.

Soweit keine anderen Definitionen angegeben sind, weisen alle technischen und wissenschaftlichen Begriffe, die hierin verwendet werden, dieselbe Bedeutung auf, wie sie üblicherweise vom Fachmann auf dem Gebiet, an den sich diese Erfindung wendet, verstanden werden. Alle Veröffentlichungen, Patentanmeldungen, Patente und anderen hierin erwähnten Referenzen sind durch Bezugnahme in ihrer Gesamtheit mit aufgenommen. Im Falle eines Konfliktes wird jedoch die vorliegende Beschreibung einschließlich der Definitionen entscheiden. Zusätzlich sind die Materialien, Methoden und Beispiele lediglich veranschaulichend und sollen nicht als einschränkend aufgefasst werden.

1. Identifizierung des Tubulysin-Biosyntheseclusters in *Angiococcus disciformis* An d48 durch mariner Transposon-Mutagenese mittels pMycoMar

Die Identifizierung des Tubulysin-Biosyntheseclusters wurde durch die Erstellung einer Transposon-Mutantenbank aus *Angiococcus disciformis* An d48 mittels pMycoMar durchgeführt.

Rubin & Mekalanos (Proc. Natl. Acad. Sci. USA, 96 (1999), 1645 - 1650) entwickelten aus dem mariner Element *Himar1* das Plasmid pMycoMar, welches ein einfaches Transpositionssystem darstellt, das effizient Bakterien *in vivo* infizieren und Insertions-Mutanten generieren kann. Dieses Plasmid enthält das Mini-Transposon *magellan4*, bei dem das Tn5 Kanamycin-Resistenzgen und der *oriR6K* von den inverted repeats des *Himar1* flankiert sind. Zusätzlich ist die *Himar1* Transposase unter der transkriptionalen Kontrolle des T6 Promotors in das mycobakterielle Temperatur-sensitive Replicon pPR23 kloniert worden. Das pMycoMar codiert ebenfalls ein Gentamycin-Resistenzgen.

Das *Himar1* zeichnet sich bei der Transposition durch eine TA Dinucleotid-Erkennungssequenz aus. Daher kann es zufällig in ein Wirts-Genom integrieren und statistisch gesehen alle aktiven Gene durch eine Insertions-Mutation ausschalten. Aufgrund dieser Tatsache sollte eine Mutantenbank aus An d48 generiert und das Tubulysin-Biosynthesecluster durch eine Knockout-Mutante identifiziert werden.

Alternativ kann man auch von *Archangium gephyra* DSM 11092 ausgehen und nach einem Protokoll von Biozym Diagnostic (Oldendorf, DE; Katalog TSM99K2; pEZ::TN<KAN-2> Tnp Transposome-Kit) arbeiten.

1.1 Generierung der Mutantenbank

Für eine Elektrotransformation von *A. disciformis* An d48 wurden zwei verschiedene Protokolle verwendet. Diese Protokolle wurden für die Myxobakterien *Stigmatella aurantiaca* (Stamm & Plaga, Arch. Microbiol., 172 (1995), 483 - 494) und *Myxococcus xanthus* (Kashefi & Hartzell, Mol. Microbiology, 15 (1995) 483 - 494) etabliert. Die beiden Methoden zeigten in der Transformationseffizienz des *A. disciformis* An d48 keinen Unterschied, so dass die Elektrotransformation zur Erstellung der Transposonbank nach dem Protokoll für *Stigmatella aurantiaca* durchgeführt wurde. Im folgenden sind die beiden Protokolle aufgeführt.

1.1.1. Elektrotransformation von *Angiococcus disciformis* An d48 nach *Stigmatella aurantiaca*-Protokoll

Eine in 50 ml Tryptonmedium (10 g Trypton; 2 g MgSO_4 , 0,1 % Vitamin B12 [10 ng/ml]; 0,2 % Glucose auf 1 l Medium; pH 7,2) gewachsene *A. disciformis* Kultur wird bis 2×10^8 Zellen / ml bei 30°C kultiviert. Ausgehend von einer Generationszeit von 6 Stunden, wurde diese Kultur am Vortag so angeimpft, dass rechnerisch diese Zelldichte erreicht wird. Die Kultur wird bei 20°C abzentrifugiert (20min; 4000rpm) und die Zellen im gleichen Volumen Waschpuffer (5 mM HEPES/NaOH, 0,5 mM CaCl_2 , pH 7,2) resuspendiert. Nach erneuter Zentrifugation wird in 25 ml Puffer resuspendiert und erneut abzentrifugiert. Vor diesem Zentrifugationsschritt wird die absolute Zellzahl innerhalb der 25 ml bestimmt, so dass rechnerisch 1×10^9 Zellen/ 40 µl resuspendiert werden.

Elektroporationsbedingungen:

1-3 µg DNA und 40 µl Zellsuspension werden gemischt und in eine auf Eis gekühlte Elektroporationsküvette (0,1 cm) gegeben. Die Elektroporation wird bei 200 Ω, 25 mF und 0,85 kV / cm durchgeführt.

Direkt nach der Elektroporation wird 1 ml Tryptonmedium zugegeben. Nach Transfer in 50 ml Tryptonmedium werden die Zellen für eine phänotypische Expression 6 h bei 30°C geschüttelt. Danach wird die Kultur abzentrifugiert (20 min, 4000 rpm, 20°C) und in 1 ml Trypton resuspendiert. Ausgehend von einer 100 %-igen Überlebensrate der Zellen wird eine Verdünnungsreihe erstellt und $1 \cdot 10^8$ - $1 \cdot 10^4$ Zellen werden mit 3 ml Trypton-Softagar auf Kanamycin haltigen (50 µg / ml) Tryptonplatten plattiert. Diese Platten werden bei 30°C inkubiert und nach 5 - 8 Tagen sind die ersten Klone zu sehen.

1.1.2. Elektrotransformation von *Angiococcus disciformis* An d48 nach *Myxococcus xanthus*-Protokoll

Die Wachstumsbedingungen der Vor- und Hauptkultur sowie Zentrifugationen und das abschließende Einengen der Zellzahl wurden genauso durchgeführt wie unter 1.1.1. angegeben ist. Dies ist abweichend vom Standardprotokoll für *Myxococcus xanthus* optimiert worden.

Elektroporationsbedingungen:

1-3 µg DNA und 40 µl Zellsuspension werden gemischt und in eine auf Eis gekühlte Elektroporationsküvette (0,1 cm) gegeben. Die Elektroporation wird bei 400 Ω, 25 µF und 0,65kV / cm durchgeführt.

Direkt nach der Elektroporation wird 1 ml Tryptonmedium zugegeben und in einem 1,5 ml Eppendorf-Reagenzgefäß für 6 h bei 30°C geschüttelt. Ausgehend von einer 100%-igen Überlebensrate der Zellen wird eine Verdünnungsreihe erstellt und $1 \cdot 10^8$ - $1 \cdot 10^4$ Zellen mit 3 ml Trypton-Softagar auf Kanamycin haltigen (50 µg / ml) Tryptonplatten plattiert. Diese Platten werden bei 30°C inkubiert und nach 5 - 8 Tagen sind die ersten Klone / Mutanten zu sehen, die mittels Impföse gepickt wurden.

1.2 Kultivierung der Transposonmutanten

Die Mutanten wurden in 96'er Mikrotiter-Platten in 200 µl M7-Medium (5 g Probion; 1 g CaCl_2 ; 1 g MgSO_4 ; 1g Hefeextrakt; 5 g Stärke; 10 g HEPES; 0,1 % Vitamin B12 [10 ng / ml] auf 1 l Medium; pH7,4) bei 32°C inkubiert und nach 10 Tagen eine Kopie der gesamten Bank erstellt. Dafür wurden 50 µl Kultur jeder Mutante in neue Mikrotiter-Platten mit 100 µl M7-Medium transferiert. Nach weiteren sieben Tagen Inkubation wurde eine Kopie bei -80°C als Dauerkulturen eingefroren. Die verbleibende Kopie der Bank wurde extrahiert, der Extrakt mittels Toxizitätstest auf generierte Tubulysin Knockout-Mutanten untersucht.

Bei der Identifizierung von Mutanten, die in dieser Analytik Veränderungen zum Wildtyp zeigten (keine Zellkernfragmentierung), wurden diese aus der Dauerkultur rekultiviert. Zur Kontrolle der erzielten Ergebnisse sollten 50 ml M7-Medium Großkulturen der entsprechenden Mutanten erneut getestet werden. Bei eventuellen Tubulysin Knockout-Mutanten wurden die Extrakte zunächst über einen HPLC-Lauf fraktioniert und anschließend die Fraktionen mittels Toxizitätstest auf Tubulysin untersucht. Durch die vorhergehende Fraktionierung wird eine Maskierung der Tubulysin-Wirkung durch Myxothiazol vermieden. Da die beiden

Sekundärmetabolite verschiedene Retentionszeiten bei der Elution von einer C-14 Säule besitzen, liegen beide im folgenden Toxizitätstest in unterschiedlichen Fraktionen vor.

1.3 Toxizitätstest

Die Mini-Kulturen aus den 96-Mikrotiterplatten wurden nach Kultivierung durch Stickstoff-Begasung auf einem Heizblock bei 37°C eingetrocknet. Danach wurden die Zellpellets über 2 h in 100µl Methanol resuspendiert und jeweils 10 µl für den folgenden Toxizitätstest eingesetzt, um eine Tubulysin-Produktion der jeweiligen Mutante detektieren zu können.

Für diesen Test werden L929 Zellen in DMEM-Medium (Invitrogen, Groningen) bei 37°C kultiviert und danach mittels Zellschaber vorsichtig geerntet. Diese Zellsuspension wird anschließend 1 : 10 mit DMEM verdünnt und 120 µl pro Öffnung einer 96-Mikrotiterplatte verteilt. Diese werden anschließend mit den 10 µl Zellextrakt der einzelnen Transposon-Mutanten versetzt und für fünf Tage bei 37°C inkubiert. Nach dieser Inkubationszeit werden die L929 Zellen mikroskopisch auf ZellkernfrAGMENTIERUNG untersucht, was ein Zeichen für Tubulysineinwirkung ist. Bei Zellen, die keine ZellkernfrAGMENTIERUNG zeigten, wurden die entsprechenden Mutanten als mutmaßliche Tubulysin Knockout-Mutanten identifiziert. Die Extrakte dieser Mutanten wurden in 50 ml M7-Medium (+ 1ml Absorber-Harz XAD-16 von Rohm & Haas) angezogen und die Zellkerne der L929-Zellen nach durchgeführtem Toxizitätstest zusätzlich durch eine Anfärbung des Chromosoms mittels DAPI-Färbung auf eine ZellkernfrAGMENTIERUNG bzw. Tubulysin-Produktion untersucht.

1.4 Bestimmung des Integrationsgenortes der Tubulysin Knockout-Mutanten in der An d48 mariner vermittelten Mutantenbank mittels Transposon-recovery

In der generierten Mutantenbank konnten mittels Toxizitätstest fünf Mutanten identifiziert werden (MutT176, 524, 781, 794 und 929), die kein Tubulysin produzierten. Dieses Ergebnis konnte nach Rekultivierung der Mutanten aus der Dauerkultur und erneuter Analyse bestätigt werden. Um Informationen zu erhalten, in welchen Bereich des Genoms das *Himar1* Element transponiert ist, wurde ein Transposon-recovery durchgeführt. Bei dieser Methodik wird die chromosomale DNA der jeweiligen Mutante mit verschiedenen Restriktionsenzymen geschnitten, die nicht innerhalb der bekannten *magellan4* Sequenz schneiden. Die restringierte DNA wird ligiert, nach Transformation in DH5 α / λ pir-Zellen wird auf Kanamycin haltigen LB-Platten bei 37°C inkubiert. Auf diesen Platten können nur solche *E.coli* Zellen wachsen, die ein Plasmid mit dem *magellan4* und somit dem Tn5 Kanamycin-Resistenzgen enthalten. Solch ein Plasmid enthält an den Enden des Transposons chromosomale DNA aus An d48. Diese Plasmide können in den *E.coli* Zellen DH5 α / λ pir replizieren, da innerhalb der Transposon Sequenz der *oriR6K* sitzt. Das Transposon wurde so aus dem jeweiligen Genom isoliert und mit den Primern K388 und K389 ansequenziert. Die erhaltenen Sequenzen wurden dann gegen die Genbank auf Homologien zu bekannten Genen hin untersucht und zeigten dabei hohe Ähnlichkeiten zu nicht ribosomalen Peptidsynthetasen (NRPS) aus bekannten Sekundärmetabolit-Biosynthesegenclustern wie denen des Myxothiazols, Nostopeptolids und Saframycins. Diese Analysen waren eindeutige Hinweise dafür, dass es sich dabei um Sequenzfragmente aus dem gesuchten Tubulysin-Gencluster handelt. Durch Restriktions- und Southernanalysen wurde die Größe der

einzelnen Transposon-Plasmide und ihre relativen Integrationsorte zueinander (innerhalb des Genclusters) bestimmt.

1.4.1. Transposon-recovery

Isolieren chromosomaler DNA nach Standardprotokollen aus 50 ml Tryptonmedium-Kultur jeder *A. disciformis* An d48 Mutante. Von dieser DNA werden 5 µg für die folgende Ausklonierung des Transposons verwendet, indem zunächst eine Restriktion durchgeführt wird. Dabei wurden die Enzyme *NotI* und *BamHI* verwendet, die keine Restriktionsstelle innerhalb des *magellan4* haben und statistisch relativ häufig in GC-reicher DNA schneiden sollten.

Verdau der genomischen DNA mit *NotI* bzw. *BamHI*:

5 µg DNA
+ 3 µl 10 x NEB Puffer
+ 3 µl 100 x BSA
+ 10 U Restriktionsenzym (*BamHI* bzw. *NotI*)
+ x µl dest. H₂O
30 µl Ansatz für 3 h bei 37°C inkubieren ⇒ wiederum 10 U Enzym zu den Restriktionsansätzen zugeben und weitere 2 h bei 37°C inkubieren.

Fällen der restringierten DNA und folgende Ligation

Der gesamte Restriktionsansatz von 30 µl wird mit 1 Vol. Chloroform/Phenol versetzt und für 10 min. zentrifugiert (13.200 rpm; 20°C). Der Überstand wird in ein neues Reaktionsgefäß überführt und mit 1/10 Vol. 3 M NaOAc und 2,5 Vol. 100% EtOH versetzt. Zum fällen der DNA wird das

Reaktionsgefäß für 1 h bei -20°C inkubiert und anschließend für 30 min. zentrifugiert (13.200 rpm; 4°C). Der Überstand wird verworfen und das Pellet dreimal mit 70% EtOH gewaschen, wobei man jeweils 5 min. zentrifugiert (13.200 rpm; 20°C). Nach dem Verwerfen des Überstandes wird das Pellet bei 37°C getrocknet und in 15 µl H₂O resuspendiert. Für die anschließende Ligation werden die gesamten 15 µl der gefällten DNA verwendet.

Ligationsansatz:

	15 µl DNA
+	4 µl 5 x Ligasepuffer (NEB)
+	<u>1 µl NEB Ligase</u>

20 µl Ansatz über Nacht bei 16°C inkubiert

⇒ wiederum 1 µl Ligase zu den Ligationensätzen und ÜN
bei 16°C inkubieren.

Elektrotransformation der Ligationsansätze in den *E. coli* Stamm DH5 α - λ pir

1-3 μ l der Ligationsansätze und 50 μ l DH5 α - λ pir Zellen werden gemischt und in eine auf Eis gekühlte Elektroporationskuvette (0,1 cm) gegeben. Die Elektroporation wird bei 200 Ω , 25 mF und 1,25kV / cm durchgeführt. Die Zellen werden danach in 1 ml LB-Medium (10 g Trypton; 10 g NaCl; 5 g Hefeextrakt auf 1 l Medium) aufgenommen und für 1 h bei 37°C inkubiert. Danach werden sie auf Kanamycin-haltigen (50 μ g / ml) LB-Platten ausplattiert. Nach einem Tag Inkubation bei 37°C können die Klone gepickt werden. Dabei können nur Zellen anwachsen, die ein Transposon-Plasmid beinhalten und damit eine Tn5-Kan^R vermittelte Resistenz besitzen.

1.5 Sequenzauswertung des Tubulysin Biosynthese-Genclusters aus pMutT794/NotI

Das Transposon-Plasmid pMutT794/NotI enthält 52985 bp chromosomale DNA aus *Angiococcus disciformis* An d48. Zusammen mit dem *HimarI* Minitransposon *magellan4* (2199 bp), das bei Basenpaar 37317 bp in das Plasmid integriert ist, wurden 55184 bp sequenziert. Insgesamt 21760 bp stammen aus codierenden Genen des Tubulysin-Genclusters und sowie 31219 bp weitere codierende Gene. Bei diesen ORF's handelt es sich zum Teil um Regulatorgene, die die Expression des Tubulysins beeinflussen können. Sequenzvergleiche mit den Transposon-Plasmiden der anderen Tubulysin Knockout-Mutanten zeigten, dass das *magellan4* bei den Mutanten MutT781 (36975bp) und MutT929 (36197 bp) innerhalb von 1658 bp zu MutT794 in das Biosynthese-Gencluster transponiert sind.

Auf der Sequenz ist der Start des Tubulysin-Genclusters mit drei NRPS-Modulen (*tubA-C*), einem Cyclodeaminase codierendem Gen (*tubZ*) und einem PKS-Modul (*tubD*) enthalten. Desweiteren liegen innerhalb des Genclusters ein Anionentransporter codierendes Gen (ORF1), das zum Austransport des Tubulysins aus der Zelle dient und ein weiterer ORF (ORF2). Die grundsätzliche Anordnung der Gene, sowie der einzelnen Domänen mit einer N-Methyltransferase innerhalb der Adenylierungsdomänen (A) von *tubB* und *tubC*, entsprechen dem typischen Aufbau des Genclusters und der damit verbundenen Tubulysin-Biosynthese. Die Methyltransferase-Domänen (NMT) sind aber im Gegensatz zu bekannten Genclustern-Strukturen nicht zwischen der Adenylierungs- und Thiolierungs-Domäne (PCP) lokalisiert, sondern zwischen A8 und A9 innerhalb der Adenylierungs-Domäne (A) (hoch konservierte Regionen innerhalb der Adenylierungs-Domänen von NRPS; Konz & Marahiel, Chem. Biology, 6 (1999) R39 - R48). *TubA*, codiert eine unvollständige

Kondensationsdomäne, die für die Biosynthese theoretisch nicht benötigt wird. Die am Ende der bekannten Sequenz liegende Polyketidsynthase (PKS) enthält eine Ketoacylsynthase- (KS), Acyltransferase- (AT) und Ketoreduktase- (KR) Domäne.

Die restliche Sequenz des Tubulysin-Biosynthesegenclusters wurde aus einer Cosmidbank von An d48 (hinterlegt bei der DSMZ) unter Standardbedingungen identifiziert. Das auf der ersten Hälfte der Sequenz endende PKS-Modul (*tubD*) wird fortgesetzt von den schon erwähnten KS, AT und KR-Domänen und beinhaltet weiterhin eine Enoylreduktase (ER) und ein Acyl Carrier Protein (ACP). In der folgenden Sequenz von *tubD* wird eine NRPS codiert, die eine Heterozyklisierungs- (HC), Adenylierungs- (A) und Peptidyl Carrier Protein- (PCP) Domäne trägt. Des weiteren folgen die Gene *tubE* und *tubF*. Das Gen *tubE* codiert eine NRPS mit den Domänen C, A und PCP. Auf *tubF* wird eine PKS mit der folgenden Domänen-Anordnung codiert: Ketoacylsynthase (KS), Acyltransferase (AT), Ketoreduktase (KR), C-Methyltransferase (CMT), Dehydratase (DH), Enoylreduktase (ER), Acyl Carrier Protein (ACP) und schließlich eine Thioesterase, die für die Abspaltung des fertigen Tubulysins in Form einer freien Säure vom Multienzymkomplex sorgt. Der Insertionsort des Transposons *magellan4* liegt bei der MutT176 bei Basenpaar 54579 innerhalb des Biosynthesegenclusters. Der Insertionsort der Mutante MutT524 liegt nicht auf der uns bekannten Gencluster-Sequenz. Wir postulieren daher, dass der Insertionsort innerhalb eines für eine Acyltransferase codierenden Genes liegt, das downstream vom Tubulysin-Biosynthesegencluster liegt und eine posttranslationale Funktion zur Modifikation des Tubulysins hat.

2. Identifizierung der Anschlusssequenz des Tubulysin-Biosynthese-Genclusters aus *Angiococcus disciformis* An d48

2.1 Identifizierung und Charakterisierung von Cosmiden, die eine überlappende Sequenz downstream zum Tubulysin-Biosynthese-Gencluster tragen

Im vorhergehenden Beispiel wurde beschrieben wie die erste Hälfte des Tubulysin-Biosynthese-Genclusters zusammen mit weiteren an der Biosynthese beteiligten Genen mittels mariner basierender Transposon-Mutagenese und anschließendem Transposon-recovery identifiziert und annotiert wurde. Da innerhalb dieser Sequenz sowohl codierende Gene für Monooxygenasen als auch Acyltransferasen fehlen, sollte noch weitere Sequenz downstream von dieser identifiziert und charakterisiert werden. Innerhalb dieser Sequenz sollten oben angegebene Gene codiert vorliegen, da sie für die Biosynthese des Tubulysins erforderlich sind. Das Biosynthese-Gencluster sollte auf diesem Weg vollständig identifiziert werden.

Hierfür wurde eine Cosmidbank aus *A. disciformis* An d48 mittels Gigapack II XL packaging-kit (Fa. Stratagene) in *E. coli* SURE erstellt. Innerhalb dieser Bank sollten Cosmide identifiziert werden, die einen längeren Überlapp mit dem Tubulysin-Biosynthese-Gencluster downstream von *tubF* besitzen. Dafür wurden aus der bekannten Sequenz des Tubulysin-Genclusters zwei Primerpaare abgeleitet und die PCR-Amplifikate als Sonden für die folgende Hybridisierung der Cosmidbank eingesetzt. Das erste Primerpaar ASTls1A-1B liefert ein 889 bp großes DNA-Fragment und liegt 1 kb vor der *NotI*-Restriktionsschnittstelle in *tubD*. Das zweite Primerpaar ASTls2A-2B generiert ein 700 bp Fragment, das 11 kb upstream im bekannten Cluster-Ende entfernt in *tubC* liegt.

Die PCR wurde bei 54°C Annealing-Temperatur durchgeführt. Durch diese Hybridisierung konnten verschiedene Cosmide identifiziert werden. Mittels PCR- und Restriktionsanalytik wurden sie auf die Größe ihrer Überlappung mit der bekannten Cluster-Sequenz untersucht. Hierfür wurden wiederum die Primerpärchen ASTls1A/B und ASTls2A/B bei einer Annealing-Temperatur von 58°C eingesetzt. Bei der Restriktion wurden verschiedene Enzyme in Einzel- und Doppelrestriktionen eingesetzt.

Da die Cosmide F7 und F13 nach den Restriktionsanalysen einen ähnlich großen Überlapp mit dem ersten Teil des Clusters zeigten, trägt eines dieser Cosmide die nötigen genetischen Informationen, um die unmittelbar clustergebundenen Gene identifizieren zu können.

2.1.1 Southern-Analytik der Cosmide F7 und F13

Für die Identifizierung des richtigen Cosmids wurden zunächst Restriktionsenzyme ausgewählt, die möglichst selten und am Ende der bekannten Genclustersequenz schneiden. Die ausgewählten Enzyme waren *NdeI* und *NsiI*, die an den Positionen 39306 bp bzw. 39430 bp schneiden. Des weiteren schneiden beide Enzyme nur ein weiteres Mal in der bekannten Sequenz. Mit einer generierten Sonde (Primerpaar Tls_{up/down}), die hinter diesen Schnitten direkt am Ende der bekannten Cluster-Sequenz bindet, sollte nun die Cosmid-Genbank „gescreent“ werden. Die Cosmide wurden dafür in verschiedenen Doppelrestriktionsansätzen hydrolisiert und auf einem Agarosegel (0,8 %) aufgetrennt. Für die Doppelrestriktion wurden neben *NdeI* und *NsiI* die Enzyme *BamHI*, *EcoRI*, und *NotI* ausgewählt. Durch die Kombinationen mit *EcoRI* und *NotI* sollte erreicht werden, dass mittels der Hybridisierung ein Fragment identifiziert wird, welches bis an das Ende des jeweiligen

Cosmid-Inserts reicht. Falls dieses Fragment für eine nachfolgende Klonierung zu groß sein sollte, wurde ebenfalls *Bam*HI verwendet, um eventuell kürzere Fragmente zu erhalten. Die Hybridisierung wurde bei 42°C durchgeführt, und es wurde unter höchst stringenten Bedingungen gewaschen (68°C).

Das Ergebnis dieser Analytik war, dass in dem *Eco*RI / *Nde*I-Restriktionsansatz des Cosmids F7 ein 12 kb Fragment detektiert wurde. Dieses Fragment enthält die restliche Sequenz des Tubulysin-Genclusters und reicht bis zum Ende der Insert-Sequenz des Cosmids. Diese Schlussfolgerung wurde aus den Restriktionsanalysen und der charakterisierten Überlappung mit der Tubulysin-Genclustersequenz geschlossen. Das detektierte *Not*I / *Nde*I - Fragment ergab eine Größe von 4,2 kb. Daher muss innerhalb der 12 kb Insertsequenz von F7 - zwischen Anfang (*Nde*I - Restriktionsstelle) und Vektor (*scos*) - mindestens eine weitere *Not*I-Schnittstelle liegen. Somit kann die Anschlusssequenz in kleineren Fragmenten (als *Nde*I / *Not*I - und *Not*I / *Not*I-Fragmente) kloniert und sequenziert werden. Der *Bam*HI / *Nsi*II Doppelrestriktionsansatz lieferte insgesamt fünf Fragmente.

2.1.2. Klonierung der restlichen Tubulysin-Genclustersequenz aus Cosmid F7

Das Cosmid F7 wurde in einem Doppelrestriktionsansatz mit den Restriktionsendonucleasen *Nsi*II und *Eco*RI geschnitten (2 h; 37°C). Nach einer Auftrennung des Restriktionsansatzes mittels 0,8 %igem Agarosegel, wurde die entsprechende Bande aus dem Gel ausgeschnitten und mit dem NucleoSpin kit (Fa. Macherey-Nagel) extrahiert. Das isolierte Fragment wurde mit *Not*I

nachgeschnitten, um zu überprüfen, ob die erzielten Hybridisierungsergebnisse bestätigt werden. Zusätzlich wurde überprüft ob weitere *NotI*-Erkennungssequenzen innerhalb der 12 kb Anschlusssequenz liegen, um die Anzahl der zu klonierenden Teilfragmente bestimmen zu können. Die Restriktion ergab nach einer Auftrennung auf einem 0,8%igem Agarosegel ein 4,2 (*NsiI* / *NotI*-Fragment) und 8 kb großes Fragment (*NotI* / *NotI*-Fragment).

Zum einen konnte somit das Hybridisierungsergebnis bestätigt werden und beide Fragmente konnten für eine Klonierung eingesetzt werden. Zum anderen wurde bestätigt, dass es sich um das richtige Fragment handelt, das die Sequenz downstream des Clusters trägt.

Kloniert wurden das 12,2 kb große *NsiI* / *EcoRI* - Fragment, sowie die 4,2 kb (*NsiI* / *NotI*) und 8 kb (*NotI* / *NotI*) großen Fragmente in den Vektor pUC18. Der Vektor wurde für die folgende Ligation mit *PstI* / *EcoRI* bzw. *PstI* / *NotI* und *NotI* geschnitten. *PstI* und *NsiI* besitzen ein kompatibles Schnittmuster, so dass nach erfolgreicher Klonierung, diese Schnittstellen nicht mehr vorhanden sind. Mittels *HindIII* bzw. *NdeI* und *EcoRI* kann in einer Doppelrestriktion das 12 kb Insert wieder aus dem pUC18 - Derivat herausgeschnitten werden.

Die erhaltenen Klone wurden mittels dieser Restriktionsansätze auf ihre Richtigkeit hin überprüft. Einer dieser Klone (ASpUC12) wurde für eine folgende *in vitro* Transposition mittels GPSTM - 1 Genome Priming System (Fa. New England Biolabs_{Inc}) eingesetzt.

2.1.3. In vitro Transposition mit GPS - 1TM Genome Priming System

Durch das GPS - 1 System sollte mittels einer auf Tn7 basierenden *in vitro* Transposition das klonierte *NsiI* / *NotI* Fragment sequenziert werden. Bei diesem „kit“ wird eine TnsABC Transposase verwendet, die das Transposon (Transprimer™) zufällig in die Zielsequenz inseriert. Durch spezifische Sequenzierprimer (PrimerN / PrimerS), die aus den flankierenden Enden des Transposons „herauslesen“, können die anliegenden Bereiche des DNA-Inserts sequenziert werden. Da das Transposon zufällig in die Zielsequenz inseriert wird, kann durch Sequenzieren einer bestimmten Anzahl generierter Transposon-Mutanten die gesamte Zielsequenz charakterisiert werden.

Durchführung der *in vitro* Transposition

	2 µl 10 x GPS-Puffer
+	1 µl pGPS 1.1 (vermittelt Kan ^R)
+	0,2 µl Ziel - DNA (entsprechen 80 ng ASexp7)
+	14,8 µl dH ₂ O
	<hr/>
	18 µl Ansatz

Dieser Ansatz wird gut durchmischt und mit 1 µl TnsABC Transposase versetzt (wiederum durchmischen). Der gesamten Reaktionsansatz wird für 10 min. bei 37°C inkubiert, damit sich die Transposase vor der eigentlichen Reaktion im Reaktionsansatz vermischt. Nach der Zugabe von 1 µl „start solution“ wird der Reaktionsansatz für eine Stunde bei 37°C inkubiert. In dieser Zeit kommt es zum Strangtransfer des Transposons in die Ziel-DNA. Danach wird die Reaktion durch Inkubation für 10 min. bei 75 °C abgestoppt. Von diesem Ansatz wurden 2 µl in *E.coli* DH10B transformiert und auf Kanamycin-haltigem Medium ausplattiert. Insgesamt sind ca. 2000 Klone nach einer Inkubation über Nacht bei 37°C gewachsen.

Von diesen Klonen wurden 20 daraufhin überprüft, in welchem Verhältnis das Transposon in das Insert oder den Vektor inseriert ist. Dafür wurden diese Klone in einem Doppelrestriktionsansatz mit den Endonukleasen *EcoRI* und *HindIII* hydrolisiert. Die Restriktionsanalyse ergab, dass bei 75% der Klone das Transposon in das Insert inseriert waren. Somit wurden 192 Klone sequenziert, wodurch eine ca. 12 fache Abdeckung der Sequenz erreicht wurde (bei 500 bp Lauflänge je Sequenzierung).

2.2 Sequenzanalyse und Annotieren der 12 kb Anschlusssequenz

Die erhaltene Restsequenz des Tubulysin-Biosynthese-Genclusters ist 12.219 bp lang und hat eine Überlappung mit der vorher identifizierten Sequenz von 133 bp. Sequenzabschnitte, bei denen nur eine einfache Abdeckung vorlag, wurden durch erneute Sequenzierungen spezifischer Klone doppelsträngig sequenziert. In dieser Sequenz ist von Basenpaar 6416 - 6898 eine Acyltransferase (Position 76.787 - 77.545 bp in Gesamtsequenz) codiert. Die anderen identifizierten ORFs haben ebenfalls eine Funktion in der Tubulysin-Biosynthese. Die Gesamtsequenz beträgt somit 82.868 bp.

3. Identifizierung einer Tubulysin überproduzierenden Mutante innerhalb der mariner-Transposon Mutantenbank

Um die Mutanten der Transposonbank auf weitere auffällige Phänotypen gegenüber dem Wildtypen zu untersuchen, wurde eine HPLC-Analytik durchgeführt. Dabei wurde überprüft, ob die Insertion des Transposons in chromosomale Bereiche von

Biosynthese-Genclustern anderer, exprimierter Sekundärstoffe stattgefunden hat. Bei diesen Vergleichen gegenüber einem Extrakt des Wildtypen sollten dann nicht produzierende Mutanten der jeweiligen Metabolite identifiziert werden. Zu diesen Metaboliten gehören das Myxothiazol (Gerth et al. 1980 J Antibiot (Tokyo) **33**(12):1474-1479 und Silakowski et al. 1999 J Biol Chem. **274**(52):37391-9, Myxochelin (Gerth et al. 1983 J Antibiot (Tokyo) **36**(9):1150-6. und Silakowski et al. 2000 Eur J Biochem. **267**(21):6476-85) und Angiolam (Kunze et al. 1985, J Antibiot (Tokyo) **38**(12):1649-54).

Bei den Auswertungen der 1.200 HPLC-Läufe fielen Extrakte einiger Mutanten auf, bei denen eine erhöhte Myxothiazol-Produktion gemessen werden konnte. Zur Kontrolle der erzielten Ergebnisse wurden 50 ml M7-Medium Kulturen der entsprechenden Mutanten erneut getestet und Zeitkinetiken zur Myxothiazol-Produktion über mehrere Tage gegenüber dem Wildtypen, erstellt. Die Ergebnisse dieser Untersuchungen zeigten eine deutlich erhöhte Produktion des Myxothiazols in den verschiedenen Mutanten bezogen auf den An d48 Wildtypen.

Die Bestimmung des Transposon-Insertionsortes innerhalb der jeweiligen Mutante erfolgte mittels „Transposon-recovery“ und anschließender Sequenzierung der flankierenden Bereiche (siehe 1.4). Die erhaltenen Sequenzen wurden gegen die Genbank auf Homologien zu bekannten Genen hin untersucht und zeigten hohe Ähnlichkeiten zu regulatorischen Elementen / Genen aus bakteriellen Organismen. Aufgrund dieser Ergebnisse wurde die gesamte Mutantenbank auf Tubulysin überproduzierende Mutanten hin untersucht. Dafür wurde der bestehende Toxizitätstest (siehe 1.3) optimiert. Durch mehrfache Verdünnungen des jeweilig eingesetzten Mutanten-Extraktes im Toxizitätstest wird eine

Ausdünnung des Tubulysins erreicht und somit ist die charakteristische Wirkung auf L929 Zellen ab einer bestimmten Verdünnung nicht mehr detektierbar. Anhand dieser Verdünnungsreihen (aus der gesamten Mutantenbank) wurden Mutanten identifiziert, bei denen signifikant höhere Verdünnungen benötigt werden, um keine Wirkung mehr feststellen zu können. Dies bedeutet, dass die jeweiligen Mutante eine erhöhte Produktion des Tubulysins aufweist.

Es konnte die Mutante Mut158 identifiziert werden, die eine vierfach erhöhte Tubulysin D-Produktion zeigte. Dieses Ergebnis wurde sowohl durch die Anzucht der Mutante in 50 ml Kulturen über HPLC-MS Untersuchungen, als auch mehreren Kinetiken mit folgendem, optimiertem Toxizitätstest gegenüber dem Wildtypen gezeigt. Mittels des Toxizitätstest wurde sogar eine achtfache Überproduktion von Tubulysinen ermittelt. Dabei wird die Gesamtwirkung aller Tubulysin-Derivate detektiert und nicht nur die von Tubulysin D. Die Mutante 158 weist somit völlig überraschend noch Überexpression von weiteren Tubulysinen gegenüber dem Wildtypen von *A. disciformis* auf. Dies war in keinster Weise zu erwarten gewesen. Die Ausklonierung des genomischen Bereichs unmittelbar an der Insertionsstelle des Transposons und die Sequenzierung erfolgte wie unter 1.4 beschrieben.

Die Sequenz des betroffenen Gens zeigt hohe Ähnlichkeiten zu einer Proteinkinase (aus *Stigmatella aurantiaca*), wobei der Insertionsort des Transposons die Promotorregion dieses Gens betrifft. Ohne auf diesen Wirkmechanismus festgelegt zu werden, besitzt dieses Gen eine negativ regulatorische Funktion für die Tubulysin-Bildung, weshalb eine Inaktivierung des Gens zu einer erhöhten Produktion führt. Die Gesamtsequenz beinhaltet 2.200

bp, wobei die Proteinkinase von Basenpaar 1.228 - 20 codiert wird und insgesamt 1.209 bp groß ist. Der upstream liegende ORF codiert ein Tubulysin-Biosynthese Protein und ist 933 bp groß.

Primersequenzen:

Sequenzierprimer für das *Himar1* Mini-Transposon *magellan4*

K-388: 5'→3' 5'TGG GAA TCA TTT GAA GGT TGG^{3'} SEQ ID NO: 39

K-389: 3'→5' 5'TGT GTT TTT CTT TGT TAG ACC G^{3'} SEQ ID NO: 40

Primerpaar ASTls1A/B wurde abgeleitet aus *tubD* und ergibt ein 889 bp Fragment

ASTls1A 5'CAC CCG GAC CTG CCT GGA TTC^{3'} SEQ ID NO: 41

ASTls1B 5'TGC TCG GCT GGC GCT ACT CAC^{3'} SEQ ID NO: 42

Primerpaar ASTls2A/B wurde abgeleitet aus *tubC* und ergibt ein 700 bp Fragment

ASTls2A 5'GCT CCC GGG CCA CGT GGT TGA AGA^{3'} SEQ ID NO: 43

ASTls2B 5'CCG CGG GCC GTG GCA GTG GTG TA^{3'} SEQ ID NO: 44

Primerpaar Tls_{up} / Tls_{down} wurde abgeleitet aus *tubF* und ergibt ein 125 bp Fragment

Tls_{up} 5'TGG CAG CCA GCC CGA GC^{3'} SEQ ID NO: 45

Tls_{down} 5'CCG CGG GTG CCC TCT CAT C^{3'} SEQ ID NO: 46

Name des Gens (ob PKS oder NRPS)	Codierende Region in der Sequenz (SEQ ID NO:)	Codierende Region auf dem minus-Strang (SEQ ID NO:)	Größe in bp Größe des abgeleiteten/ übersetzten Proteins in Da	Klassifizierung der Domäne und Position in Nucleotidsequenz oder Protein mit höchster Ähnlichkeit
Funktion SEQ ID NO der Aminosäuresequenz				
ORF16:	3.308 – 1	79.561 – 82.866	3.308 bp 122.434 Da	49% Identität, 64% Ähnlichkeit zu Valyl- tRNA Synthetase [<i>Thermotoga maritima</i>] NP_229614
Valyl tRNA-Synthase SEQ ID NO: 32	(SEQ ID NO: 1)	(SEQ ID NO: 18)		
ORF15:	4.706 – 3.453	78.163 – 79.416	1.254 bp 41.337 Da	38% Identität, 61% Ähnlichkeit zu "response" Regulator CheY Unterfamilie [<i>Synechocystis sp.</i>] NP_440346
Regulatorische Komponente eines sensorischen Transduktionssystems SEQ ID NO: 31	(SEQ ID NO: 1)	(SEQ ID NO: 18)		
ORF14:	5.719 – 7.164		1.446 bp 52.449 Da	29% Identität, 44% Ähnlichkeit zu "response" Regulator Protein [<i>Mesorhizobium loti</i>] NP_102571
Zwei-Komponenten "response" Regulator SEQ ID NO: 2	(SEQ ID NO: 1)			
ORF13:	9.557 – 7.317	73.312 – 75.552	2.241 bp 83.814 Da	29% Identität, 46% Ähnlichkeit zu Zwei- Komponenten Regulationssystem aus Sensorkinase / "response" Regulator-Hybrid [<i>Agrobacterium tumefaciens</i>] NP_535879
Zwei-Komponenten Regulationssystem aus Sensorkinase/"response" Regulator-Hybrid SEQ ID NO: 30	(SEQ ID NO: 1)	(SEQ ID NO: 18)		

ORF12: Hitzeschockprotein SEQ ID NO: 29	12.193 - 10.550 (SEQ ID NO: 1)	70.676 - 72.319 (SEQ ID NO: 18)	1.644 bp 58.650 Da	70% Identität, 85% Ähnlichkeit zu Hitzeschock - protein GroEL [<i>Rhodothermus marinus</i>] AAD37976	
ORF11: Tubulysin Biosynthese Protein SEQ ID NO: 3	12.841 - 13.881 (SEQ ID NO: 1)		1.041 bp 37.818 Da	34% Identität, 56% Ähnlichkeit zu hypothetischem Protein [<i>Corynebacterium glutamicum</i>] NP_616546	
ORF10: Tubulysin Biosynthese Protein SEQ ID NO: 28	14.833 - 13.835 (SEQ ID NO: 1)	68.036 - 69.034 (SEQ ID NO: 18)	999 bp 36.441 Da	33% Identität, 47% Ähnlichkeit zu konserviert hypothetischem Protein [<i>Streptomyces coelicolor</i>] NP_631315	
ORF9: Transkriptionsregulator SEQ ID NO: 4	14.942 - 15.586 (SEQ ID NO: 1)		645 bp 23.789 Da	30% Identität, 51% Ähnlichkeit zu Transkriptionsregulator, TetR Familie [<i>Caulobacter crescentus</i>] NP_420005	
ORF8: Integrase SEQ ID NO: 5	15.847 - 16.983 (SEQ ID NO: 1)		1.137 bp 41.614 Da	24% Identität, 40% Ähnlichkeit zu Integrase [<i>Corynebacterium glutamicum</i>] NP_601233	

ORF7:	21.154 - 18.809 (SEQ ID NO: 1)	61.715 - 64.016 (SEQ ID NO: 18)	2.346 bp 89.255 Da	33% Identität, 47% Ähnlichkeit zu hypothetischem Protein [<i>Nostoc sp.</i>] NP_490333	
Tubulysin Bioynthese Protein SEQ ID NO: 27					
ORF6:	22.366 - 23.532 (SEQ ID NO: 1)		1.167 bp 43.228 Da	32% Identität, 46% Ähnlichkeit zu Serin/Threonin-Kinase Pkn14 [<i>Myxococcus xanthus</i>] AAK64427	
Serin/Threonin-Kinase SEQ ID NO: 6					
ORF5:	24.591 - 26.513 (SEQ ID NO: 1)		1.923 bp 68.825 Da	42% Identität, 56% Ähnlichkeit zu Proteinkinase [<i>Stigmatella aurantiaca</i>] CAD19078	
Proteinkinase SEQ ID NO: 7					
ORF4:	26.597 - 27.517 (SEQ ID NO: 1)		921 bp 33.507 Da	33% Identität, 37% Ähnlichkeit zu Adenindeaminase- verwandtem Protein [<i>Deinococcus radiodurans</i>] NP_285591	
Adenindeaminase SEQ ID NO: 8					
ORF3:	29.858 - 30.400 (SEQ ID NO: 1)		543 bp 20.880 Da	24% Identität, 41% Ähnlichkeit zu möglicher Cytosindeaminase [<i>Salmonella typhimurium</i>] NP_462244	
Cytosindeaminase SEQ ID NO: 9					
<i>tubA</i> SEQ ID NO: 10	31.220 - 32.392 (SEQ ID NO: 1)		1.173 bp 43.202 Da	Ähnlichkeit zu C-Domänen "core motifs" / Kernmotive C2-C3	

ORF2	33.056 - 32.397 (SEQ ID NO: 1)	49.813 - 50.472 (SEQ ID NO: 18)	660 bp 25.390 Da	29% Identität, 42% Ähnlichkeit zu conserved hypothetical protein [<i>Neurospora crassa</i>] CAD11370	
SEQ ID NO: 26 <i>tubZ</i>	34.195 - 33.074 (SEQ ID NO: 1)	48.674 - 49.795 (SEQ ID NO: 18)	1.122 bp 40.499 Da	39% Identität, 53% Ähnlichkeit zu Lysin- Cyclodeaminase [<i>Streptomyces hygroscopicus</i>] CAA60467	
ORF1	35.422 - 34.205 (SEQ ID NO: 1)	47.447 - 48.664 (SEQ ID NO: 18)	1.218 bp 46.030 Da	40% Identität, 65% Ähnlichkeit zu Anionen transportierende ATPase [<i>Aquifex aeolicus</i>] NP_213468	
SEQ ID NO: 24 <i>tubB</i>	35.522 - 40.147 (SEQ ID NO: 1)		4.626 bp 170.704 Da	C 35.747 - 36.769 A 37.184 - 39.817 NMT 38.369 - 39.730 in A-Domäne zwischen "core motif" / Kernmotiv A8 und A9 PCP 39.818 - 40.069	76 - 416 555 - 1.432 950 - 1.403
SEQ ID NO: 11					1.433 - 1.516

<i>tubC</i>	40.144 - 48.021 (SEQ ID NO: 1) 1 - 7.878 (SEQ ID NO: 33)		7.878 bp 289.141 Da	C 40.372-41.397 A 41.824-43.215 PCP 43.216-43.461 C 43.552-44.574 A 44.980-47.631 NMT 46.153-47.547 in A- Domäne zwischen "core motif" / Kernmotiv A8 und A9 PCP 47.632-47.868	77-418 561-1.024 1.025-1.106 1.137-1.477 1.613-2.496 2.004-2.468 2.497-2.575
<i>tubD</i>	48.011 - 58.558 (SEQ ID NO: 1)		10.548 bp 383.778 Da	KS 48.011-49.321 AT 49.622-50.584 KR 51.473-52.309 ER 53.066-53.980 ACP 54.158-54.460 HC 54.461-55.870 A 56.000-57.412 PCP 57.413-57.643	1-437 538-858 1.155-1.433 1.686-1.990 2.050-2.150 2.151-2.620 2.664-3.134 3.135-3.211
<i>tubE</i>	58.551 - 62.096 (SEQ ID NO: 1) 18.408 - 21.953 (SEQ ID NO: 33)		3.546 bp 130.337 Da	C 58.689-59.714 A 60.156-61.697 PCP 61.698-61.967	47-388 536-1.049 1.050-1.139
<i>tubF</i>	62.103 - 70.616 (SEQ ID NO: 1)		8.514 bp 309.369 Da	KS 62.127-63.320 AT 63.711-64.676 KR 64.959-65.882 CMT 65.985-67.061 DH 67.242-67.829 ER 68.247-69.128 PCP 69.360-69.605 TE 69.759-70.586	9-406 537-858 953-1.260 1.295-1.653 1.714-1.909 2.049-2.342 2.420-2.501 2.553-2.828

ORF17: Ähnlichkeit zu Patatin ähnlichem Protein (Lipid Acylhydrolase) SEQ ID NO: 23	71.640 - 70.583 (SEQ ID NO: 1)	11.229 - 12.284 (SEQ ID NO: 18)	1.056 bp 38.371 Da	24% Identität, 40% Ähnlichkeit zu Patatin ähnlichem Protein [<i>Anabaena</i> <i>sp. 90</i>] CAC01602	
ORF18: Ähnlichkeit zu Patatin ähnlichem Protein (Lipid Acylhydrolase) SEQ ID NO: 22	72.786 - 71.731 (SEQ ID NO: 1)	10.083 - 11.138 (SEQ ID NO: 18)	1.056 bp 38.371 Da	24% Identität, 40% Ähnlichkeit zu Patatin ähnlichem Protein [<i>Anabaena</i> <i>sp. 90</i>] CAC01602	
ORF19: Tubulysin Bioynthese Protein SEQ ID NO: 21	75.209 - 74.655 (SEQ ID NO: 1)	7.660 - 8.214 (SEQ ID NO: 18)	555 bp 20.040 Da	31% Identität, 43% Ähnlichkeit zu hypothetischem Protein [<i>Azotobacter vinelandii</i>] ZP_00092207	
ORF20: Tubulysin Bioynthese Protein SEQ ID NO: 14	75.488 - 76.645 (SEQ ID NO: 1)		1.158 bp 43.282 Da	41% Identität, 62% Ähnlichkeit zu hypothetischem Protein [<i>Microbulbifer degradans</i>] ZP_00065421	
<i>tubG</i> : Acyltransferase SEQ ID NO: 15	76.787 - 77.545 (SEQ ID NO: 1)		759 bp 28.039 Da	47% Identität, 53% Ähnlichkeit zu N- hydroxyarylamine O- acetyltransferase [<i>Streptomyces avermitilis</i>] NP_826733	

ORF21: Tubulysin Bioynthese Protein SEQ ID NO: 16	77.769 - 78.695 (SEQ ID NO: 1)		927 bp 33.859 Da	28% Identität, 39% Ähnlichkeit zu konserviert hypothetischem Protein [Xanthomonas axonopodis] NP_641500	
ORF22: Tubulysin Bioynthese Protein SEQ ID NO: 17	79.138 - 80.019 (SEQ ID NO: 1)		882 bp 32.668 Da	37% Identität, 49% Ähnlichkeit zu hypothetischem Protein [Rhizobium elii] NP_659913	
ORF23: Tubulysin Bioynthese Protein SEQ ID NO: 20	81.319 - 80.057 (SEQ ID NO: 1)	1.550 - 2.812 (SEQ ID NO: 18)	1.263 bp 49.133 bp	34% Identität, 52% Ähnlichkeit zu hypothetischem Protein [Nostoc punctiforme] ZP_00109292	
ORF24: Carboxylatreductase SEQ ID NO: 19	82797 - 81.721 (SEQ ID NO: 1)	72 - 1.148 (SEQ ID NO: 18)	1.077 bp 37.621 Da	31% Identität, 44% Ähnlichkeit zu Pyrrolin Carboxylatreductase NosF [Nostoc sp.] AAF17284	
ORF25: Proteinkinase SEQ ID NO: 38	1.228 - 20	973 - 2181 (SEQ ID NO: 36)	1.209 bp 44.079 Da	Tubulysin überproduzierende Mutante	
ORF26: Tubulysin Bioynthese Protein SEQ ID NO: 37	2.157 - 1.225	44 - 976 (SEQ ID NO: 36)	933 bp 33.229 Da	Tubulysin überproduzierende Mutante	

KS: Ketoacylsynthase
AT: Acyltransferase
KR: Ketoreduktase
DH: Dehydratase
ER: Enoylreduktase
ACP: acyl carrier protein / Acyl-Trägerprotein
CMT: C-Methyltransferase
NMT: N-Methyltransferase
A: Adenylierungsdomäne
C: Kondensationsdomäne
PCP: peptidyl carrier protein / Peptidyl-Trägerprotein
TE: Thioesterase

bp: Basenpaare
Da: Dalton

Patentansprüche

1. ss-DNA-Molekül, ausgewählt aus der folgenden Gruppe:
 - (i) ss-DNA-Molekül mit einer Sequenz gemäß Figur 1;
 - (ii) ss-DNA-Molekül, das mit einem ss-DNA-Molekül gemäß (i) hinsichtlich seiner Nucleotid-Anzahl oder seiner Nucleotid-Sequenz zu jeweils 90, 91, 92, 93, 94, 95, 96, 97, 98, 99 oder 100% homolog ist, jedoch von dem ss-DNA-Molekül gemäß (i) hinsichtlich seiner Nucleotid-Anzahl und/oder seiner Nucleotid-Sequenz in mindestens einem Nucleotid abweicht; und

- (iii) ss-DNA-Molekül mit einer Sequenz, die zur Sequenz eines ss-DNA-Moleküls gemäß (i) oder (ii) komplementär ist.
2. ds-DNA-Molekül aus einem ss-DNA-Molekül gemäß Anspruch 1 und einem dazu komplementären Strang.
3. ss-DNA-Molekül, ausgewählt aus der folgenden Gruppe:
- (i) ss-DNA-Molekül mit einer Sequenz der Positionen 3.308 bis 1 (ORF 16) der Sequenz gemäß Figur 1;
 - (ii) ss-DNA-Molekül mit einer Sequenz der Positionen 4706 bis 3453 (ORF 15) der Sequenz gemäß Figur 1;
 - (iii) ss-DNA-Molekül mit einer Sequenz der Positionen 5719 bis 7164 (ORF 14) der Sequenz gemäß Figur 1;
 - (iv) ss-DNA-Molekül mit einer Sequenz der Positionen 9557 bis 7317 (ORF 13) der Sequenz gemäß Figur 1;
 - (v) ss-DNA-Molekül mit einer Sequenz der Positionen 12193 bis 10550 (ORF 12) der Sequenz gemäß Figur 1;
 - (vi) ss-DNA-Molekül mit einer Sequenz der Positionen 12841 bis 13881 (ORF 11) der Sequenz gemäß Figur 1;
 - (vii) ss-DNA-Molekül mit einer Sequenz der Positionen 14833 bis 13835 (ORF 10) der Sequenz gemäß Figur 1;
 - (viii) ss-DNA-Molekül mit einer Sequenz der Positionen 14942 bis 15586 (ORF 9) der Sequenz gemäß Figur 1;

- (ix) ss-DNA-Molekül mit einer Sequenz der Positionen 15847 bis 16983 (ORF 8) der Sequenz gemäß Figur 1;
- (x) ss-DNA-Molekül mit einer Sequenz der Positionen 21154 bis 18809 (ORF 7) der Sequenz gemäß Figur 1;
- (xi) ss-DNA-Molekül mit einer Sequenz der Positionen 22366 bis 23532 (ORF 6) der Sequenz gemäß Figur 1;
- (xii) ss-DNA-Molekül mit einer Sequenz der Positionen 24591 bis 26513 (ORF 5) der Sequenz gemäß Figur 1;
- (xiii) ss-DNA-Molekül mit einer Sequenz der Positionen 26597 bis 27517 (ORF 4) der Sequenz gemäß Figur 1;
- (xiv) ss-DNA-Molekül mit einer Sequenz der Positionen 29858 bis 30400 (ORF 3) der Sequenz gemäß Figur 1;
- (xv) ss-DNA-Molekül mit einer Sequenz der Positionen 31220 bis 32392 (TubA) der Sequenz gemäß Figur 1;
- (xvi) ss-DNA-Molekül mit einer Sequenz der Positionen 33056 bis 32397 (ORF 2) der Sequenz gemäß Figur 1;
- (xvii) ss-DNA-Molekül mit einer Sequenz der Positionen 34195 bis 33074 (TubZ) der Sequenz gemäß Figur 1;
- (xviii) ss-DNA-Molekül mit einer Sequenz der Positionen 35422 bis 34205 (ORF 1) der Sequenz gemäß Figur 1;
- (xix) ss-DNA-Molekül mit einer Sequenz der Positionen 35522 bis 40147 (TubB) der Sequenz gemäß Figur 1;

- (xx) ss-DNA-Molekül mit einer Sequenz der Positionen 40144 bis 48021 (TubC) der Sequenz gemäß Figur 1;
- (xxi) ss-DNA-Molekül mit einer Sequenz der Positionen 48011 bis 58558 (TubD) der Sequenz gemäß Figur 1;
- (xxii) ss-DNA-Molekül mit einer Sequenz der Positionen 58551 bis 62096 (TubE) der Sequenz gemäß Figur 1;
- (xxiii) ss-DNA-Molekül mit einer Sequenz der Positionen 62103 bis 70616 (TubF) der Sequenz gemäß Figur 1;
- (xxiv) ss-DNA-Molekül, das mit einem Molekül gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii) oder (xxiii) unter stringenten Bedingungen hybridisierbar ist und insbesondere dieselbe Anzahl von Basen aufweist; und
- (xxv) ss-DNA-Molekül, das mit einem ss-DNA-Molekül gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii) oder (xxiii) hinsichtlich seiner Nucleotid-Anzahl oder seiner Nucleotid-Sequenz zu jeweils 90, 91, 92, 93, 94, 95, 96, 97, 98, 99 oder 100% homolog ist, jedoch von diesem ss-DNA-Molekül hinsichtlich seiner Nucleotid-Anzahl und/oder seiner Nucleotid-Sequenz in mindestens einem Nucleotid abweicht; und

(xxvi) ss-DNA-Molekül mit einer Sequenz, die zur Sequenz eines Moleküls gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii), (xxiii), (xxiv) oder (xxv) komplementär ist.

4. ds-DNA-Molekül aus einem ss-DNA-Molekül gemäß Anspruch 3 und einem dazu komplementären Strang.

5. ss-DNA-Molekül, ausgewählt aus der folgenden Gruppe:

- (i) ss-DNA-Molekül mit einer Sequenz der Positionen 35747 bis 36769 (Domäne C des tubB-Gens) der Sequenz gemäß Figur 1;
- (ii) ss-DNA-Molekül mit einer Sequenz der Positionen 37184 bis 39817 (Domäne A des tubB-Gens) der Sequenz gemäß Figur 1;
- (iii) ss-DNA-Molekül mit einer Sequenz der Positionen 38369 bis 39730 (Domäne NMT des tubB-Gens) der Sequenz gemäß Figur 1;
- (iv) ss-DNA-Molekül mit einer Sequenz der Positionen 39818 bis 40069 (Domäne PCP des tubB-Gens) der Sequenz gemäß Figur 1;
- (v) ss-DNA-Molekül mit einer Sequenz der Positionen 40372 bis 41397 (Domäne C des tubC-Gens) der Sequenz gemäß Figur 1;

- (vi) ss-DNA-Molekül mit einer Sequenz der Positionen 41824 bis 43215 (Domäne A des tubC-Gens) der Sequenz gemäß Figur 1;
- (vii) ss-DNA-Molekül mit einer Sequenz der Positionen 43216 bis 43461 (Domäne PCP des tubC-Gens) der Sequenz gemäß Figur 1;
- (viii) ss-DNA-Molekül mit einer Sequenz der Positionen 43552 bis 44574 (Domäne C des tubC-Gens) der Sequenz gemäß Figur 1;
- (ix) ss-DNA-Molekül mit einer Sequenz der Positionen 44980 bis 47631 (Domäne A des tubC-Gens) der Sequenz gemäß Figur 1;
- (x) ss-DNA-Molekül mit einer Sequenz der Positionen 46153 bis 47547 (Domäne NMT des tubC-Gens) der Sequenz gemäß Figur 1;
- (xi) ss-DNA-Molekül mit einer Sequenz der Positionen 47632 bis 47868 (Domäne PCP des tubC-Gens) der Sequenz gemäß Figur 1;
- (xii) ss-DNA-Molekül mit einer Sequenz der Positionen 48011 bis 49321 (Domäne KS des tubD-Gens) der Sequenz gemäß Figur 1;
- (xiii) ss-DNA-Molekül mit einer Sequenz der Positionen 49622 bis 50584 (Domäne AT des tubD-Gens) der Sequenz gemäß Figur 1;

- (xiv) ss-DNA-Molekül mit einer Sequenz der Positionen 51473 bis 52309 (Domäne KR des tubD-Gens) der Sequenz gemäß Figur 1;
- (xv) ss-DNA-Molekül mit einer Sequenz der Positionen 53066 bis 53980 (Domäne ER des tubD-Gens) der Sequenz gemäß Figur 1;
- (xvi) ss-DNA-Molekül mit einer Sequenz der Positionen 54158 bis 54460 (Domäne ACP des tubD-Gens) der Sequenz gemäß Figur 1;
- (xvii) ss-DNA-Molekül mit einer Sequenz der Positionen 54461 bis 55870 (Domäne HC des tubD-Gens) der Sequenz gemäß Figur 1;
- (xviii) ss-DNA-Molekül mit einer Sequenz der Positionen 56000 bis 57412 (Domäne A des tubD-Gens) der Sequenz gemäß Figur 1;
- (xix) ss-DNA-Molekül mit einer Sequenz der Positionen 57413 bis 57643 (Domäne PCP des tubD-Gens) der Sequenz gemäß Figur 1;
- (xx) ss-DNA-Molekül mit einer Sequenz der Positionen 58689 bis 59714 (Domäne C des tubE-Gens) der Sequenz gemäß Figur 1;
- (xxi) ss-DNA-Molekül mit einer Sequenz der Positionen 60156 bis 61697 (Domäne A des tubE-Gens) der Sequenz gemäß Figur 1;

- (xxii) ss-DNA-Molekül mit einer Sequenz der Positionen 61698 bis 61967 (Domäne PCP des tubE-Gens) der Sequenz gemäß Figur 1;
- (xxiii) ss-DNA-Molekül mit einer Sequenz der Positionen 62127 bis 63320 (Domäne KS des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxiv) ss-DNA-Molekül mit einer Sequenz der Positionen 63711 bis 64676 (Domäne AT des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxv) ss-DNA-Molekül mit einer Sequenz der Positionen 64959 bis 65882 (Domäne KR des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxvi) ss-DNA-Molekül mit einer Sequenz der Positionen 65985 bis 67061 (Domäne CMT des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxvii) ss-DNA-Molekül mit einer Sequenz der Positionen 67242 bis 67829 (Domäne DH des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxviii) ss-DNA-Molekül mit einer Sequenz der Positionen 68247 bis 69128 (Domäne ER des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxix) ss-DNA-Molekül mit einer Sequenz der Positionen 69360 bis 69605 (Domäne PCP des tubF-Gens) der Sequenz gemäß Figur 1;

- (xxx) ss-DNA-Molekül mit einer Sequenz der Positionen 69759 bis 70586 (Domäne TE des tubF-Gens) der Sequenz gemäß Figur 1;
- (xxxi) ss-DNA-Molekül, das mit einem Molekül gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii), (xxiii), (xxiv), (xxv), (xxvi), (xxvii), (xxviii), (xxix) oder (xxx) unter stringenten Bedingungen hybridisierbar ist und insbesondere dieselbe Anzahl von Basen aufweist;
- (xxxii) ss-DNA-Molekül, das mit einem Molekül gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii), (xxiii), (xxiv), (xxv), (xxvi), (xxvii), (xxviii), (xxix) oder (xxx) hinsichtlich seiner Nucleotid-Anzahl oder seiner Nucleotid-Sequenz zur jeweils 90, 91, 92, 93, 94, 95, 96, 97, 98, 99 oder 100% homolog ist, jedoch von diesem ss-DNA-Molekül hinsichtlich seiner Nucleotid-Anzahl und/oder seiner Nucleotid-Sequenz in mindestens einem Nucleotid abweicht; und
- (xxxiii) ss-DNA-Molekül mit einer Sequenz, die zur Sequenz eines Moleküls gemäß (i), (ii), (iii), (iv), (v), (vi), (vii), (viii), (ix), (x), (xi), (xii), (xiii), (xiv), (xv), (xvi), (xvii), (xviii), (xix), (xx), (xxi), (xxii), (xxiii), (xxiv), (xxv), (xxvi), (xxvii), (xxviii), (xxix), (xxx), (xxxi) oder (xxxii) komplementär ist.

6. ds-DNA Molekül aus einem ss-DNA-Molekül gemäß Anspruch 5 und einem dazu komplementärem Strang.
7. Varianten oder Mutanten, die aus einer Substitution, Insertion oder Deletion von Nucleotiden oder einer Inversion von Nucleotid-Segmenten eines ss-DNA-Moleküls gemäß Anspruch 1, 3 oder 5 oder eines ds-DNA-Moleküls gemäß Anspruch 2, 4 oder 6 resultieren, wobei diese Varianten und Mutanten Enzym-Varianten oder Enzym-Mutanten für die Produktion von Sekundarstoff(en) mit für Tubulysine charakteristischen Eigenschaften codieren.
8. RNA
 - (a) mit einer Sequenz entsprechend der eines ss-DNA-Moleküls gemäß einem der Ansprüche 1, 3, 5 oder 7 oder
 - (b) mit einer Sequenz einer RNA gemäß (a), aber in Gegenrichtung (anti-sense), oder
 - (c) mit einer Sequenz einer RNA gemäß (a) oder (b) und mit einem dazu komplementären Strang,jeweils gegebenenfalls als Element eines rekombinanten Vektors.
9. Rekombinanter Vektor, insbesondere Expressionsvektor mit einem DNA-Molekül gemäß einem der Ansprüche 1 bis 7.
10. Zelle, insbesondere zur Expression, in die ein DNA-Molekül gemäß einem der vorhergehenden Ansprüche oder einen Vektor gemäß Anspruch 8 oder 9 integriert ist.
11. Zelle nach Anspruch 10, wobei sich die Zelle von kultivierbaren Bakterien, insbesondere Myxobakterien, vorzugsweise Angiococcus, insbesondere A. disciformis, Archangium, insbesondere A. gephyra, Escherichia coli, Pseudomonaden oder Actinomyceten herleitet.

12. Verwendung eines Vektors gemäß Anspruch 8 oder 9 für die Transformation von Zellen oder Organismen zur transienten oder permanenten Expression eines oder mehrerer Proteine (Expressionsprodukt(e)), das (die) durch eine DNA (ssDNA oder dsDNA) des Vektors codiert wird (werden).
13. Verwendung einer Zelle gemäß Anspruch 10 oder 11 zur enzymatischen Biosynthese, Mutasyntese oder Partial-Synthese eines Tubulysins, insbesondere Tubulysin A, B; C, D, E und/oder F.
14. Expressionsprodukt eines DNA-Moleküls gemäß einem der Ansprüche 1 bis 7 oder eines Vektors gemäß Anspruch 8 oder 9 oder einer Zelle gemäß Anspruch 10 oder 11.
15. Polynucleotid enthaltend eine Sequenz wie in SEQ ID NO: 1, 18, 33 oder 36 definiert, oder ein Fragment davon.
16. Polynucleotid nach Anspruch 15, wobei das Fragment eine im Sequenzprotokoll definierte CDS ist.
17. Vektor enthaltend ein Polynucleotid nach Anspruch 15 oder 16.
18. Zelle enthaltend einen Vektor nach Anspruch 17.
19. Polypeptid enthaltend wenigstens eine Sequenz wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder ein Fragment und/oder Derivat davon.

20. Verwendung wenigstens eines Polynucleotids wie in SEQ ID NO: 1, 18, 33 und/oder 36 definiert und/oder wenigstens eines Fragments davon und/oder wenigstens eines Polypeptids wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder wenigstens eines Fragments davon zur Herstellung einer pharmazeutischen Zusammensetzung zur Behandlung von unerwünschtem Zellwachstums oder unerwünschter Zellvermehrung in einem Individuum.

21. Verwendung nach Anspruch 20, wobei das unerwünschte Zellwachstum oder die unerwünschte Zellvermehrung ein Tumor ist.

22. Verwendung nach Anspruch 20, wobei das unerwünschte Zellwachstum eine pathogene Infektion ist.

23. Verwendung nach Anspruch 22, wobei die pathogene Infektion eine Mykose, Malaria oder eine parasitäre Erkrankung ist.

24. Pharmazeutische Zusammensetzung, enthaltend wenigstens ein Polynucleotid wie in SEQ ID NO: 1, 18, 33 und/oder 36 definiert und/oder wenigstens ein Fragment davon und/oder wenigstens ein Polypeptid wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder wenigstens ein Fragment davon.

25. Pharmazeutische Zusammensetzung nach Anspruch 24, die weiterhin wenigstens einen pharmazeutisch verträglichen Trägerstoff enthält.

26. Verfahren zur Herstellung von Tubulysinen und Tubulysin-Biosynthese Proteinen, umfassend die Schritte:

- (a) exprimieren von wenigstens einem Polynucleotid wie in SEQ ID NO: 1, 18, 33 und/oder 36 definiert und/oder

wenigstens einem Fragment davon und/oder wenigstens einem Polypeptid wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder wenigstens einem Fragment davon, und

(b) aufreinigen der Expressionsprodukte.

27. Verfahren nach Anspruch 26, wobei die Expression in prokaryotischen oder eukaryotischen Zellen und/oder durch in vitro Expression erfolgt.

28. Verfahren zum Auffinden von Genen, die an der Biosynthese von Tubulysinen beteiligt sind, umfassend die Schritte:

(a) hybridisieren von wenigstens einem Polynucleotid wie in SEQ ID NO: 1, 18, 33 und/oder 36 definiert und/oder wenigstens einem Fragment davon mit DNA, RNA, und/oder cDNA einer Spezies, die nicht mit *Angiococcus disciformis* identisch ist, und

(b) isolieren und charakterisieren der hybridisierten DNA, RNA, und/oder cDNA.

29. Kit zur Herstellung von Tubulysinen, enthaltend:

(a) wenigstens ein Polynucleotid nach Anspruch 15 oder 16 und/oder wenigstens einen Vektor nach Anspruch 17 oder

(b) geeignete Medien und Puffer zur Vermehrung von Zellen, die eine Expression des Polynucleotids und/oder Vektors erlauben und

(c) geeignete Mittel zum Aufreinigen des/der Expressionsprodukte(s).

30. Verwendung einer Zusammensetzung enthaltend wenigstens ein Polypeptid wie in SEQ ID NO: 2 bis 17, 19 bis 32, 34, 35, 37 und/oder 38 definiert und/oder wenigstens ein biologisch aktives Fragment oder Derivat davon als Desinfektionsmittel.

31. Verwendung nach Anspruch 30, wobei die Zusammensetzung flüssig oder pulverförmig ist.

32. Desinfektionsmittel wie in Anspruch 30 oder 31 definiert.

Figur 1

SEQUENCE LISTING

<110> Gesellschaft fuer Biotechnologische Forschung mbH

<120> Tubulysin-Biosynthesegene

<130> 13289

<160> 1

<170> PatentIn version 3.1

<210> 1

<211> 70782

<212> DNA

<213> *Angiococcus disciformis*

<400> 1

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Val Arg Ala Ile Lys Ser Gly Ala Ala Glu Tyr Leu Val Lys Pro Val						
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Ala Pro Glu Ala Leu Gln His Ala Val Arg Arg Ala Leu Thr Thr Arg						
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Asp Leu Leu Gln Glu Asn Ala Ser Leu Arg Arg His Val Ala Met Leu						
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Glu Ala Gly Gln Arg Ile Ala Thr Thr Leu Glu Arg Glu Lys Leu Ala						
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Met Thr Lys Trp Ser Gly Lys Trp
1045

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Ile Gly Gly Arg Thr Tyr Thr Ala Thr Asp Gly Ser Thr Arg Trp
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Ile Ile Arg Lys Thr Val Ala Gly Val Ala Tyr Asn Val Thr Leu
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gac gtg cgg agc gag gcc gag gcc ctg gct gag ctg gcg gcc ttc 16005
Asp Val Arg Ser Glu Ala Glu Ala Leu Ala Glu Leu Ala Ala Phe
1080 1085 1090

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Arg Arg Asn Pro Ala Ala Tyr Arg Thr Ala Ser Gln Glu Arg Gln
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Ser Gly Arg Ser Asp Glu Tyr Leu Lys Ser Thr Arg Ser Tyr Leu
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Lys Lys Trp Arg Ile Ile Val Phe Lys Ser Phe Thr Ser Phe Leu
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Gln Asp Ser Gly Glu Leu Asp Pro Met Val Asn Pro Gly Arg Phe
1200 1205 1210

aag gtc ccc cct gcc cgc cgg aac cac gaa ctc aag ggc tac 16410
Leu Lys Val Pro Pro Ala Arg Arg Asn His Glu Leu Lys Gly Tyr
1215 1220 1225

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gccgcgcgtc	ccttcccacc	tggaggccgc	ac atg acc gat gac agc acg ccg			22386
			Met Thr Asp Asp Ser Thr Pro			
			1420		1425	
acc gac gaa acg cag atc gag gcc ccg acg ccg gag aac acc tcc						22431
Thr Asp Glu Thr Gln Ile Glu Ala Pro Thr Pro Glu Asn Thr Ser						
	1430		1435		1440	
gac ctg aag ggc gcc cgc ccc cga ctc cgg ttc acc atc gag acc						22476
Asp Leu Lys Gly Ala Arg Pro Arg Leu Arg Phe Thr Ile Glu Thr						
	1445		1450		1455	
acc acg tac gag acc ctc cgc acg ctg gag cgg cgg ggt aac ggc						22521
Thr Thr Tyr Glu Thr Leu Arg Thr Leu Glu Arg Arg Gly Asn Gly						
	1460		1465		1470	
gag gtg gtg ctc ctg gcc gag cgt cac ctc ccc cat gga ctc gcc						22566
Glu Val Val Leu Leu Ala Glu Arg His Leu Pro His Gly Leu Ala						
	1475		1480		1485	
ggg ctc gtc acc atc aag cgc ctg cgc aat ccc gtc act ttc gag						22611
Gly Leu Val Thr Ile Lys Arg Leu Arg Asn Pro Val Thr Phe Glu						

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cgc tgc cag cgg Arg Cys Gln Arg 1505	ctg atc gag gag gtc Leu Ile Glu Glu Val 1510	cag ctc tcc ttc cgc ctc Gln Leu Ser Phe Arg Leu 1515	22656
cac cac ccg gcc His His Pro Ala 1520	atc gcc cag gtc cat Ile Ala Gln Val His 1525	cac ctg aaa atc cat gcc His Leu Lys Ile His Ala 1530	22701
gac cgg ccg cac Asp Arg Pro His 1535	gtc atc gcc gag tac Val Ile Ala Glu Tyr 1540	gtg gac ggc ccc acg ctg Val Asp Gly Pro Thr Leu 1545	22746
gac acc atc atc Asp Thr Ile Ile 1550	agc ctc gcc acc atg Ser Leu Ala Thr Met 1555	cgc gag aag ccg ctc tcc Arg Glu Lys Pro Leu Ser 1560	22791
gcg ccc ttc gcc Ala Pro Phe Ala 1565	ctc tac atc gcc gcc Leu Tyr Ile Ala Ala 1570	gag gtg gcc gac gcc ctc Glu Val Ala Asp Ala Leu 1575	22836
cac cac gcg cac His His Ala His 1580	acg ctg aga gat tcg Thr Leu Arg Asp Ser 1585	gag aac cgg ccg ctg ggc Glu Asn Arg Pro Leu Gly 1590	22881
atc atc cac cgc Ile Ile His Arg 1595	gac gtg gcg ccc cgg Asp Val Ala Pro Arg 1600	aac atc cgc gtg gcc cgc Asn Ile Arg Val Ala Arg 1605	22926
agc ggc gag gtg Ser Gly Glu Val 1610	aag gtg acg gac ttc Lys Val Thr Asp Phe 1615	ggc gct acc tac tcg ctc Gly Ala Thr Tyr Ser Leu 1620	22971
atg gtg ggc agg Met Val Gly Arg 1625	gag gag acg ccg ggc Glu Glu Thr Pro Gly 1630	ctc ctg ctc aag ggc gac Leu Leu Leu Lys Gly Asp 1635	23016
gtg gcg tac gcc Val Ala Tyr Ala 1640	tcg ccc gag tac ctg Ser Pro Glu Tyr Leu 1645	aac cgt aag ccc atg gat Asn Arg Lys Pro Met Asp 1650	23061
ggc cgg tcc gac Gly Arg Ser Asp 1655	atc ttc tcg ctg ggc Ile Phe Ser Leu Gly 1660	ctc gtc ctc atg gag atg Leu Val Leu Met Glu Met 1665	23106
ctg acg tgc aag Leu Thr Cys Lys 1670	cac ctc ttc gac gtg His Leu Phe Asp Val 1675	gag gac gaa aag gcc ccc Glu Asp Glu Lys Ala Pro 1680	23151
aac gcc acc gtg Asn Ala Thr Val 1685	gac gtg aag acg gag Asp Val Lys Thr Glu 1690	gag acg ccc tcg gtg ccc Glu Thr Pro Ser Val Pro 1695	23196
ctc acg cag atg Leu Thr Gln Met 1700	atc gcg ctc gtc aac Ile Ala Leu Val Asn 1705	cgc tac cgc ccc gag gac Arg Tyr Arg Pro Glu Asp 1710	23241
gtg gag aac gcg Val Glu Asn Ala 1715	atg gcg ggc ctg ccg Met Ala Gly Leu Pro 1720	gac gcg ctc aag gcc atc Asp Ala Leu Lys Ala Ile 1725	23286
gtc cac aag gcc 1730	ctc cag cga aag ctc 1735	tcc gag cgc tac gcc acg 1740	23331

Val	His	Lys	Ala	Leu	Gln	Arg	Lys	Leu	Ser	Glu	Arg	Tyr	Ala	Thr	
			1730					1735						1740	
gcc	gcc	gag	atg	cgc	gat	gcg	ctg	cga	gcg	gcg	ctc	gcg	gcg	gag	23376
Ala	Ala	Glu	Met	Arg	Asp	Ala	Leu	Arg	Ala	Ala	Leu	Ala	Ala	Glu	
			1745					1750						1755	
tca	cag	ccc	ttc	ggc	cgg	aag	gag	gcg	agc	gag	gag	ctg	gcg	cgg	23421
Ser	Gln	Pro	Phe	Gly	Arg	Lys	Glu	Ala	Ser	Glu	Glu	Leu	Ala	Arg	
			1760					1765						1770	
atg	ctg	tcg	gag	gcg	tcc	gtc	ctg	cgc	gac	cgg	gtg	gaa	ctg	gac	23466
Met	Leu	Ser	Glu	Ala	Ser	Val	Leu	Arg	Asp	Arg	Val	Glu	Leu	Asp	
			1775					1780						1785	
gaa	gaa	ggc	atc	ttc	ccc	gag	ggc	ctg	gac	gcc	gac	gag	ccg	acg	23511
Glu	Glu	Gly	Ile	Phe	Pro	Glu	Gly	Leu	Asp	Ala	Asp	Glu	Pro	Thr	
			1790					1795						1800	
ccc	gca	ccg	aac	gaa	gag	tga	gaacggg	cgg	cggtgcattc	cttgaagcaa					23562
Pro	Ala	Pro	Asn	Glu	Glu										
			1805												
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	Val	Glu	Glu	Lys	Leu	Gly	Ala	Gly	Gly	Phe	Gly	Ala	Val		
			1810					1815					1820		
aac	cgc	gcc	cgg	cgt	gga	ggg	cgc	ctc	tac	gcg	ctc	aag	ctc	atc	24674
Tyr	Arg	Ala	Arg	Arg	Gly	Gly	Arg	Leu	Tyr	Ala	Leu	Lys	Leu	Ile	

cca ctc tgg ggg ctg	gct gag tgg gcc gag	cgc gaa gtg gcc atc	24719
Pro Leu Trp Gly Leu	Ala Glu Trp Ala Glu	Arg Glu Val Ala Ile	
1825	1830	1835	
1840	1845	1850	
ctc ctc cgg ctc aag	cac tcc aat ctg gtg	cgc atc cgt ggg cat	24764
Leu Leu Arg Leu Lys	His Ser Asn Leu Val	Arg Ile Arg Gly His	
1855	1860	1865	
gga cag tgg ccg gat	gag gcg cct caa tcc	ttc ttc atc gtc atg	24809
Gly Gln Trp Pro Asp	Glu Ala Pro Gln Ser	Phe Phe Ile Val Met	
1870	1875	1880	
gac tac gtg gaa ggg	cgc cgg ttg gac gta	tgg gcc aga gag gag	24854
Asp Tyr Val Glu Gly	Arg Arg Leu Asp Val	Trp Ala Arg Glu Glu	
1885	1890	1895	
aac ccc tcg gcc cga	gaa gtc gtg ctc aag	gtg cgt ggc gtg gcg	24899
Asn Pro Ser Ala Arg	Glu Val Val Leu Lys	Val Arg Gly Val Ala	
1900	1905	1910	
cgc ggg ctg ggc gcc	gcg cac cgg gcg aag	gtg gtg cat cga gac	24944
Arg Gly Leu Gly Ala	Ala His Arg Ala Lys	Val Val His Arg Asp	
1915	1920	1925	
ctg aag gag agc aac	gtc atc gag cgc acc	tcc gac gga gag gca	24989
Leu Lys Glu Ser Asn	Val Ile Glu Arg Thr	Ser Asp Gly Glu Ala	
1930	1935	1940	
gtg gtg gtg gac ttc	ggc gcg ggc ggg tac	gag agc gcc ccc agc	25034
Val Val Val Asp Phe	Gly Ala Gly Gly Tyr	Glu Ser Ala Pro Ser	
1945	1950	1955	
atc acc ggc ggc gtg	ctg cca ccg ggc acg	ccg gag tac cgc gcg	25079
Ile Thr Gly Gly Val	Leu Pro Pro Gly Thr	Pro Glu Tyr Arg Ala	
1960	1965	1970	
ccc gag gcc tgg cgc	ttc cag cag gag cac	ggg gac gag cgt ggc	25124
Pro Glu Ala Trp Arg	Phe Gln Gln Glu His	Gly Asp Glu Arg Gly	
1975	1980	1985	
cac tcc tac cag ccc	ggc ccc tcg gat gac	ctg tac tcg ctg ggc	25169
His Ser Tyr Gln Pro	Gly Pro Ser Asp Asp	Leu Tyr Ser Leu Gly	
1990	1995	2000	
gtc gtt ctc tat tgg	ctc ctg acg ggc agg	cag ccc ttc ctc ccg	25214
Val Val Leu Tyr Trp	Leu Leu Thr Gly Arg	Gln Pro Phe Leu Pro	
2005	2010	2015	
gac gag gcc gca ggg	gtg gag gcc gtg ctc	aac cgc gcc ccc aaa	25259
Asp Glu Ala Ala Gly	Val Glu Ala Val Leu	Asn Arg Ala Pro Lys	
2020	2025	2030	
cca ccc cat gtg ctc	aat cca cgc gtc ccc	gag gcc ctg agt gcc	25304
Pro Pro His Val Leu	Asn Pro Arg Val Pro	Glu Ala Leu Ser Ala	
2035	2040	2045	
gtg tgc atg cgc ctg	ctg gcc aag gag ccc	gag gag cgc cac ccg	25349
Val Cys Met Arg Leu	Leu Ala Lys Glu Pro	Glu Glu Arg His Pro	
2050	2055	2060	
gac gcc gac gcg ctg	tgc gcg gag ctg gag	gcc ctg ctg gcc cag	25394

Asp Ala Asp Ala Leu	Cys Ala Glu Leu	Glu Ala Leu Leu Ala Gln	
2065		2070	2075
gcg gac gag tcc tgg	gac gtg aaa ctc tgc	gac gcc tat ggc ccg	25439
Ala Asp Glu Ser Trp	Asp Val Lys Leu Cys	Asp Ala Tyr Gly Pro	
2080	2085	2090	
gac acc gcc acc acg	ctc gcg gcg gtg ccg	cac gcg ggc gaa gac	25484
Asp Thr Ala Thr Thr	Leu Ala Ala Val Pro	His Ala Gly Glu Asp	
2095	2100	2105	
gag ctg gtg caa tgg	ctg aag aag cgc aag	gcc cgg cct cgt cgg	25529
Glu Leu Val Gln Trp	Leu Lys Lys Arg Lys	Ala Arg Pro Arg Arg	
2110	2115	2120	
ggg cca cgt ccg cca	cac ggc gag ggc gca	cac gag ccg gac tca	25574
Gly Pro Arg Pro Pro	His Gly Glu Gly Ala	His Glu Pro Asp Ser	
2125	2130	2135	
aac gcg gtg gcc atc	cag gca gag ctg cca	ccc cca gtt cct gct	25619
Asn Ala Val Ala Ile	Gln Ala Glu Leu Pro	Pro Pro Val Pro Ala	
2140	2145	2150	
cgc ccc ggc ccc atg	ccc tcg ccg ccc ccg	gca caa gcc ggt cac	25664
Arg Pro Gly Pro Met	Pro Ser Pro Pro Pro	Ala Gln Ala Gly His	
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ttc aag gcc ctg cgt	gtg gcg acc tgg atg	ggt ctg ctg gtg gtc	25709
Phe Lys Ala Leu Arg	Val Ala Thr Trp Met	Gly Leu Leu Val Val	
2170	2175	2180	
ttg agc gcg ggc gcg	ctg gtg atc gcg cgc	acc ttg gcg cct tcc	25754
Leu Ser Ala Gly Ala	Leu Val Ile Ala Arg	Thr Leu Ala Pro Ser	
2185	2190	2195	
cct gct cct gcc gca	cgt cac gcc ctg gag	cct cac ccc agt gat	25799
Pro Ala Pro Ala Ala	Arg His Ala Leu Glu	Pro His Pro Ser Asp	
2200	2205	2210	
gcc gtg gac tca cca	cct gca tcc ccc gag	ttc gac ctc gcg ccc	25844
Ala Val Asp Ser Pro	Pro Ala Ser Pro Glu	Phe Asp Leu Ala Pro	
2215	2220	2225	
tgg gcc ccc ggc cag	gaa gtg gcg gcg cca	tgg atg gca ccg gaa	25889
Trp Ala Pro Gly Gln	Glu Val Ala Ala Pro	Trp Met Ala Pro Glu	
2230	2235	2240	
gct cag gaa gcc gca	gcc gcg ctc gat agc	gcg ccc acc cta gcg	25934
Ala Gln Glu Ala Ala	Ala Ala Leu Asp Ser	Ala Pro Thr Leu Ala	
2245	2250	2255	
gcc gtc gcc ctc ccc	gcg acg atc tcc gag	gag aag gct tcc gtg	25979
Ala Val Ala Leu Pro	Ala Thr Ile Ser Glu	Glu Lys Ala Ser Val	
2260	2265	2270	
aag atg aag aag aac	acc ggc gta ttc tcc	gag ccc gag ccg cag	26024
Lys Met Lys Lys Asn	Thr Gly Val Phe Ser	Glu Pro Glu Pro Gln	
2275	2280	2285	
cgc ttc cgg ggc gga	acc gtt ggc aag gcg	ctc ggc ctc ggt gtc	26069
Arg Phe Arg Gly Gly	Thr Val Gly Lys Ala	Leu Gly Leu Gly Val	
2290	2295	2300	

gcg ggc tgc cta gcg	atg gcc tgc cct ggc	ccc cag gtc cgc ccg	26114
Ala Gly Cys Leu Ala	Met Ala Cys Pro Gly	Pro Gln Val Arg Pro	
2305	2310	2315	
acg cct ccg cca gag	gcg tgc ccg cca ggt	gct gtc gag gcc atg	26159
Thr Pro Pro Pro Glu	Ala Cys Pro Pro Gly	Ala Val Glu Ala Met	
2320	2325	2330	
agc agg ctt cga att	gag tat gac gag gat	gtg gta gcc acc ttc	26204
Ser Arg Leu Arg Ile	Glu Tyr Asp Glu Asp	Val Val Ala Thr Phe	
2335	2340	2345	
ttc gcg acc gcc gag	gag ggg gtt agc agg	aac atc acg gtg cgc	26249
Phe Ala Thr Ala Glu	Glu Gly Val Ser Arg	Asn Ile Thr Val Arg	
2350	2355	2360	
gcg ggc ccg aca acg	gtt cac ctg ggg aga	cca ttg gga aat cta	26294
Ala Gly Pro Thr Thr	Val His Leu Gly Arg	Pro Leu Gly Asn Leu	
2365	2370	2375	
ccg gcc ccg acc acg	ctc tcc gga cgc ctc	atc atc gga gag gat	26339
Pro Ala Arg Thr Thr	Leu Ser Gly Arg Leu	Ile Ile Gly Glu Asp	
2380	2385	2390	
cgc gtt tac ggc cga	cta act gaa gca cgc	acg cca aag ggt gac	26384
Arg Val Tyr Gly Arg	Leu Thr Glu Ala Arg	Thr Pro Lys Gly Asp	
2395	2400	2405	
cgc ttc cct gta tgc	atg cag atc att gag	aac gac tct att ggg	26429
Arg Phe Pro Val Cys	Met Gln Ile Ile Glu	Asn Asp Ser Ile Gly	
2410	2415	2420	
ttc aag aag gag atc	aac gac ggc tcc aac	agc gcc tcg gtc tat	26474
Phe Lys Lys Glu Ile	Asn Asp Gly Ser Asn	Ser Ala Ser Val Tyr	
2425	2430	2435	
ccc tat ttt gac gtg	aag gcc gtc cgc cgc	ttc gag tga accccgacca	26523
Pro Tyr Phe Asp Val	Lys Ala Val Arg Arg	Phe Glu	
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tccgcgcgatg ccc atg	tca ccc atc gtt gtt ctc	ctg gtg ata gcg ctt	26632
Met Ser Pro Ile Val	Val Val Leu Leu	Val Ile Ala Leu	
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Phe Ser Gly Ala Ala	Ala Ala Gln Ser Arg	Pro Ala Ala Thr Gly	
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Leu Gly Val Arg Arg	Ile Glu Phe Ser Ala	Glu Asn Phe Glu Ala	
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atg acg aca ccg gag	gta cag ata agc ccg	ggg gtt tcc acc acg	26767
Met Thr Thr Pro Glu	Val Gln Ile Ser Pro	Gly Val Ser Thr Thr	
2490	2495	2500	
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Phe Glu Phe Asn Ser	Ala Leu Leu Gln Glu	Lys Val Ala Val Glu	
2505	2510	2515	
ggc gcc gac cgc ttc	tcg ctc gtg gac att	gga cga agc act ctc	26857

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Arg 2535	Leu	Val	Pro	Ser	Glu 2540	Gln	Val	Leu	Pro	Gly 2545	Glu	Arg	Leu	Arg	
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Val 2550	Thr	Val	Arg	Phe	Leu 2555	Asp	Gly	Ala	Ala	Pro 2560	Val	Gly	Met	Ala	
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Phe 2565	Ile	Leu	Val	Ala	His 2570	Pro	Ala	Gln	Ala	Glu 2575	Arg	Leu	Val	Glu	
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Val 2580	Trp	Arg	Asn	Gln	Arg 2585	Thr	Val	Glu	Ser	Tyr 2590	Gln	Gln	Glu	Ser	
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Lys 2595	Glu	Ala	Arg	Ala	Glu 2600	Ala	Gln	Arg	Cys	His 2605	Glu	Glu	Asn	Glu	
cgc	ctg	cgc	gcc	gag	tat	gcg	gga	ccg	ggc	ggc	ctc	gct	ggc	ctc	27127
Arg 2610	Leu	Arg	Ala	Glu	Tyr 2615	Ala	Gly	Pro	Gly	Gly 2620	Leu	Ala	Gly	Leu	
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Leu 2625	Ala	Asn	Arg	Val	Ile 2630	Gly	Lys	Ser	Gly	Val 2635	Ser	Val	Lys	Pro	
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Leu 2640	Asp	Phe	Glu	Lys	Glu 2645	Val	Arg	Gln	Arg	Pro 2650	Gly	Asp	Ala	Ile	
agg	att	ctt	cgt	gca	tgg	agc	tac	cgc	tcc	gcc	aac	cgc	gtg	tcc	27262
Arg 2655	Ile	Leu	Arg	Ala	Trp 2660	Ser	Tyr	Arg	Ser	Ala 2665	Asn	Arg	Val	Ser	
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Val 2670	Leu	Met	Asp	Leu	Asp 2675	Tyr	Pro	Glu	Ala	Ala 2680	Gln	Arg	Trp	Ile	
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Met 2700	Leu	Pro	Val	Trp	Gln 2705	Glu	Ala	Pro	Val	Ala 2710	Asn	Ala	Arg	Ile	
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Arg 2715	Arg	Leu	Val	Val	Glu 2720	Ala	Glu	Ala	Glu	Pro 2725	Asp	Ala	Ala	Gln	
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Asp 2730	Thr	Phe	Thr	Leu	Lys 2735	Leu	Trp	Glu	Ser	Asn 2740	Gly	Leu	Arg	Thr	
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Ile 2745	Thr	Leu	Ser	Gly	Val 2750	Thr	Phe	Pro							

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				2755		
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Leu Phe	Glu Ala Asp Asp Asp	Arg Asp Val Pro Ala	Asp Phe Pro			
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Trp Leu	Leu Ile Glu Ile Pro	Glu Glu Gln Leu Arg	His Ala Ala			
2775		2780	2785			
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Leu Leu	Leu Asn Glu Gly Glu	Trp Arg Pro Ser His	Ile Ser Gly			
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Ile Trp	Tyr Arg Val Asp Pro	Glu Arg Pro Ala Gln	Lys Gln Gln			
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Arg His	Val His Val Ala Ala	Lys Lys His Ile Lys	Ile Pro Thr			
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Lys Gln	Ala Ser Trp Asn Arg	Asp Thr Thr Arg His	Asp Arg Lys			
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Thr Phe	Asn Ala Lys Leu Gly	Ser Gln Gly Ser Tyr	Gln Asp Val			
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Ala Lys	Thr Ala Leu Gly Leu	Pro Pro Glu Ala Val	Leu Glu His			
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Val Val	Glu Asn Pro Ala Glu	Gln Gln Met Leu Leu	Thr Glu Ser			
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Thr Asp	Pro Gln Leu Lys Thr	Glu Phe Tyr Arg Trp	Leu Glu Ala			
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Gln Pro	Arg Arg Ser Asn Phe	Glu Ala Leu Val Glu	Asp Ala Val			
2910		2915	2920			
agg ctc	aat ctg ccg ctc gac	ctg gaa tcg taa ggcagtggtt				30410
Arg Leu	Asn Leu Pro Leu Asp	Leu Glu Ser				

2930

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			Val Ala	Leu Gln	Arg Arg	His Pro		
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Leu Leu	Arg Ala	Lys Ile	Val Ala	Gly	Thr Pro	Pro Arg	Phe Thr	
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Ser Gln	Gly Val	Pro Pro	Ile Ala	Leu	Glu Val	Val Glu	Arg Lys	
	2960			2965			2970	
gca gag	gag tcc	tgg caa	cag cat	gtc	gag gca	gag ctt	gac agg	31378
Ala Glu	Glu Ser	Trp Gln	Gln His	Val	Glu Ala	Glu Leu	Asp Arg	
	2975			2980			2985	
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Pro Phe	Asn Ser	Asp Pro	Gly Pro	Leu	Val Arg	Phe Ile	Leu Val	
	2990			2995			3000	
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Arg Gly	Glu His	Arg Ser	Glu Leu	Leu	Cys Ser	Tyr Asp	His Leu	
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Ile Gly	Asp Ala	His Ser	Gly Ile	Phe	Ala Leu	Arg Asp	Leu Leu	
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Gln Val	Met Ala	Ser Gln	Asp Gln	His	Leu Pro	Glu Leu	Ala Pro	
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agg ccc	gcc tat	gag gag	ctg att	ggg	ccg atg	gta ccg	ggc acc	31603
Arg Pro	Ala Tyr	Glu Glu	Leu Ile	Gly	Pro Met	Val Pro	Gly Thr	
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cgc ttg tct ccg Arg Leu Ser Pro 3080	acc ctc aat acg ctc Thr Leu Asn Thr Leu 3085	aca gag cgg ctc gtc gca Thr Glu Arg Leu Val Ala 3090	31693
ccg cgg ggc atg Pro Arg Gly Met 3095	gct cgc agc agc gcc Ala Arg Ser Ser Ala 3100	gag gga cag gcg ctc tac Glu Gly Gln Ala Leu Tyr 3105	31738
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gcg ctg ctg ata Ala Leu Leu Ile 3140	gct cgg gcc gag tcg Ala Arg Ala Glu Ser 3145	cag ggt gcc aag aag cgg Gln Gly Ala Lys Lys Arg 3150	31873
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ggc gtg ggt gag Gly Val Gly Glu 3170	gac ttc ggc ctg ttc Asp Phe Gly Leu Phe 3175	acc acg ggg aag acg gac Thr Thr Gly Lys Thr Asp 3180	31963
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gac atc tcc tcc Asp Ile Ser Ser 3230	cag ccc tgg atg gaa Gln Pro Trp Met Glu 3235	cgc gcg aca cgg ctg ggc Arg Ala Thr Arg Leu Gly 3240	32143
ctg cac tcc atg Leu His Ser Met 3245	ctc gcc ctg agc aac Leu Ala Leu Ser Asn 3250	gtg ggg cgt gtg gag att Val Gly Arg Val Glu Ile 3255	32188
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ggg acc acc gcg Gly Thr Thr Ala 3275	gcc cag ttc gac gtg Ala Gln Phe Asp Val 3280	gtg ctg acg gcg atc acc Val Leu Thr Ala Ile Thr 3285	32278
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3290

3295

3300

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3305 3310 3315

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3320

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				Met Thr Leu Asp Ser		
				3325		
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Arg Tyr Ala Asn Arg Gly Gly Gly Leu Tyr Glu Ile Asp Gly Leu						
3330				3335		3340
gct atc ggg cac agc ccc ccc cct tgt tca att cca gga ggg gtg						35626
Ala Ile Gly His Ser Pro Pro Pro Cys Ser Ile Pro Gly Gly Val						
3345				3350		3355
caa ttg acagcc aca gcg act gcc gag cac gcg ctg aaa gcc ctc						35671
Gln Leu Thr Ala Thr Ala Thr Ala Glu His Ala Leu Lys Ala Leu						

3360	3365	3370	
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cgg cac gcc agc ggc gaa aag gct ccc ctc tca tcc tca cag cgg Arg His Ala Ser Gly Glu Lys Ala Pro Leu Ser Ser Ser Gln Arg 3390 3395 3400	35761		
cgc atg tgg ttc ctg gag cag ctc gag cca ggc aac gcg gcc cag Arg Met Trp Phe Leu Glu Gln Leu Glu Pro Gly Asn Ala Ala Gln 3405 3410 3415	35806		
cat ttg ttg caa agt cat cac ata cag ggg cct ttg cag gta gag His Leu Leu Gln Ser His His Ile Gln Gly Pro Leu Gln Val Glu 3420 3425 3430	35851		
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gag gtg ctc atc aaa gag ctg gcg atg ctc tac ggc cag cac gtg Glu Val Leu Ile Lys Glu Leu Ala Met Leu Tyr Gly Gln His Val 3540 3545 3550	36211		
gaa ggc tcg agc ccg gag ctg gcg cca ctg ccc gtc caa tac agg Glu Gly Ser Ser Pro Glu Leu Ala Pro Leu Pro Val Gln Tyr Arg 3555 3560 3565	36256		
gac tac gct ggc tgg gag gca agc ttc gcg ccc gcg gga gag gcc Asp Tyr Ala Gly Trp Glu Ala Ser Phe Ala Pro Ala Gly Glu Ala 3570 3575 3580	36301		
ttg gag gcc tgg tgg cgg cag cgg ctc gcc ggg gtg ccc acg gtg Leu Glu Ala Trp Trp Arg Gln Arg Leu Ala Gly Val Pro Thr Val 3585 3590 3595	36346		
ctg gag ctg ccc acg gag gga gcg cgt ccc ctc aga cag acg tac	36391		

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Arg 3615	Ala	Gly	Arg	Val	Ala	Ile 3620	Thr	Val	Gln	Pro	Arg 3625	Leu	Arg	Gln	
gcg	ctg	gag	gac	ctg	gcg	cac	aag	gag	ggc	gtg	tca	ctc	ttt	gcc	36481
Ala 3630	Leu	Glu	Asp	Leu	Ala	His 3635	Lys	Glu	Gly	Val	Ser 3640	Leu	Phe	Ala	
ctg	ctg	ctc	acc	gcc	ttc	acc	acg	ctg	cta	cac	cgc	tac	tct	cgc	36526
Leu 3645	Leu	Leu	Thr	Ala	Phe	Thr 3650	Thr	Leu	Leu	His	Arg 3655	Tyr	Ser	Arg	
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Gln 3660	Glu	Glu	Leu	Val	Val	Gly 3665	Trp	Pro	Ala	Pro	Gln 3670	Arg	Pro	Arg	
ccc	gag	ctg	cat	ggc	ctc	att	gga	tac	ttc	ggc	acc	ccg	gtg	gca	36616
Pro 3675	Glu	Leu	His	Gly	Leu	Ile 3680	Gly	Tyr	Phe	Gly	Thr 3685	Pro	Val	Ala	
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Arg 3705	Gln	Leu	Asp	Gln	Glu	Val 3710	Arg	Glu	Ala	Asn	Ala 3715	His	Ala	Ala	
ctc	ccc	ttc	gag	cgg	ctg	gtg	agc	ctg	cta	gac	att	gcc	cgc	agc	36751
Leu 3720	Pro	Phe	Glu	Arg	Leu	Val 3725	Ser	Leu	Leu	Asp	Ile 3730	Ala	Arg	Ser	
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Pro 3735	Ser	Arg	His	Pro	Leu	Phe 3740	Gln	Val	Leu	Phe	Asp 3745	Leu	Leu	Pro	
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Glu 3765	Ser	Phe	Thr	Gly	Leu	Val 3770	Ala	Tyr	Asp	Leu	Thr 3775	Leu	Leu	Leu	
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Glu 3780	Pro	Arg	Gly	Glu	Gly	Leu 3785	Glu	Gly	Ala	Leu	Asp 3790	Tyr	Ser	Ala	
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Asp 3795	Leu	Phe	Ser	Glu	Ala	Arg 3800	Met	Gln	Arg	Ala	Ala 3805	Thr	Gln	Tyr	
ctg	cac	ctg	ctg	gag	cag	ctc	gtg	gag	cgg	cct	cac	gag	agg	ctc	37021
Leu 3810	His	Leu	Leu	Glu	Gln	Leu 3815	Val	Glu	Arg	Pro	His 3820	Glu	Arg	Leu	
ccg	ccg	ctg	gcg	ctc	ctc	acg	cct	ggt	gag	cac	gag	gct	ttg	ctg	37066
Ser 3825	Arg	Leu	Ala	Leu	Leu	Thr 3830	Pro	Gly	Glu	His	Glu 3835	Ala	Leu	Leu	

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gcc cac Ala His 3855	cac cgc ttc gag cac His Arg Phe Glu His 3860	cag gtg cgg ctc acc Gln Val Arg Leu Thr 3865	ccc cat cac Pro His His	37156
ccc gcg Pro Ala 3870	ttg tgc ttc ggc ccg Leu Cys Phe Gly Pro 3875	cag gtg ctc tcc tac Gln Val Leu Ser Tyr 3880	gag cag ctc Glu Gln Leu	37201
aac cgc Asn Arg 3885	cgc gcc aac ccg ctc Arg Ala Asn Pro Leu 3890	gcc cac cgg ctg cgg Ala His Arg Leu Arg 3895	cgc ctg ggc Arg Leu Gly	37246
gcg ggc Ala Gly 3900	ccg gac acc ctg gta Pro Asp Thr Leu Val 3905	ggg ctg tgc gtg gag Gly Leu Cys Val Glu 3910	cgc tcc ctg Arg Ser Leu	37291
gag ctg Glu Leu 3915	ccg gtg gca ctg ctg Pro Val Ala Leu Leu 3920	gcc ata tgg aag gcc Ala Ile Trp Lys Ala 3925	ggg gcc ggc Gly Ala Gly	37336
ttc ctt Phe Leu 3930	ccg ctg gac gtc aat Pro Leu Asp Val Asn 3935	cag ccc cgc gag cgg Gln Pro Arg Glu Arg 3940	ctc gcc ttc Leu Ala Phe	37381
ctc ctg Leu Leu 3945	gga gat gcg agc tgc Gly Asp Ala Ser Cys 3950	cgc atc ctc ctc acc Arg Ile Leu Leu Thr 3955	cag gag cac Gln Glu His	37426
ctg ctc Leu Leu 3960	cag cgc ctg ccc ccc Gln Arg Leu Pro Pro 3965	acg aac gcc gcg ctc Thr Asn Ala Ala Leu 3970	ctg tgt ctg Leu Cys Leu	37471
gag agg Glu Arg 3975	gag gcg gag gca ctg Glu Ala Glu Ala Leu 3980	gag cgc gag ccc cag Glu Arg Glu Pro Gln 3985	gag gat gcg Glu Asp Ala	37516
cca cac Pro His 3990	gag gcc ggg ctc gac Glu Ala Gly Leu Asp 3995	aac ctg gcc tac gtc Asn Leu Ala Tyr Val 4000	atc cac acc Ile His Thr	37561
tct ggc Ser Gly 4005	tcc acg ggc acg ccc Ser Thr Gly Thr Pro 4010	aag ggc atc gcg atg Lys Gly Ile Ala Met 4015	gtg cat cgc Val His Arg	37606
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ggt ggc Gly Gly 4035	ccc tca cgc acg ctc Pro Ser Arg Thr Leu 4040	cag ttc gcc tcg ctc Gln Phe Ala Ser Leu 4045	aac ttc gac Asn Phe Asp	37696
atc tgc Ile Cys 4050	tac cag gaa ctc ttc Tyr Gln Glu Leu Phe 4055	acc acc tgg gcc gct Thr Thr Trp Ala Ala 4060	ggg ggc acc Gly Gly Thr	37741
gtg gtc Val Val 4065	atg gtg acg gaa gag Met Val Thr Glu Glu 4070	gtg cgc agg gat cct Val Arg Arg Asp Pro 4075	gcc cgg ctg Ala Arg Leu	37786

ctg gaa Leu Glu 4080	gtg ctg gag cag gag Val Leu Glu Gln Glu 4085	cag gtg agc cgg ctg Gln Val Ser Arg Leu 4090	tac ctg ccc Tyr Leu Pro	37831
ttc atc Phe Ile 4095	gcc ctg cag cag ctc Ala Leu Gln Gln Leu 4100	gcg cgg gtg gcg gat Ala Arg Val Ala Asp 4105	gag cgc ggc Glu Arg Gly	37876
gcg gcc Ala Ala 4110	cct cgc cac ctg cgc Pro Arg His Leu Arg 4115	cag ctc att acc gcc Gln Leu Ile Thr Ala 4120	ggg gag caa Gly Glu Gln	37921
ctc cag Leu Gln 4125	gcg acc ccc gag ttg Ala Thr Pro Glu Leu 4130	cag cgg ctg ctc tcg Gln Arg Leu Leu Ser 4135	cgg atg ccg Arg Met Pro	37966
gag tgc Glu Cys 4140	acc ctc cac aac cag Thr Leu His Asn Gln 4145	tac ggc ccc tcc gag Tyr Gly Pro Ser Glu 4150	tgc cac gtg Cys His Val	38011
gtg acg Val Thr 4155	agc cat gac ctg aca Ser His Asp Leu Thr 4160	cgc gag ccg agc cgt Arg Glu Pro Ser Arg 4165	tgg cca cgg Trp Pro Arg	38056
ctg ccg Leu Pro 4170	ccc gta ggc cgg cca Pro Val Gly Arg Pro 4175	ctg gcc cac ctc cgg Leu Ala His Leu Arg 4180	gtg ctg ttg Val Leu Leu	38101
ctg gac Leu Asp 4185	ggg gag cag cag ctc Gly Glu Gln Gln Leu 4190	gtg cct ccg ggt gtg Val Pro Pro Gly Val 4195	gcc gga gag Ala Gly Glu	38146
gtg ttc Val Phe 4200	ctg ggc ggc ccc gcc Leu Gly Gly Pro Ala 4205	ctg gcg cgc ggc tac Leu Ala Arg Gly Tyr 4210	ctg gga cgt Leu Gly Arg	38191
ccg gag Pro Glu 4215	cag acg gct gat cgc Gln Thr Ala Asp Arg 4220	ttc gtg ccc gat cca Phe Val Pro Asp Pro 4225	ttc tcc cgc Phe Ser Arg	38236
gag cct Glu Pro 4230	gga gcc cgg ctc tac Gly Ala Arg Leu Tyr 4235	cgc acc ggg gac ctg Arg Thr Gly Asp Leu 4240	gcg cgc ctc Ala Arg Leu	38281
cga gag Arg Glu 4245	gac gga gcg ctg gag Asp Gly Ala Leu Glu 4250	ttc ctg caa cgg atg Phe Leu Gln Arg Met 4255	gac gcg cag Asp Ala Gln	38326
gtg aag Val Lys 4260	atc cgg ggc tac cgc Ile Arg Gly Tyr Arg 4265	atc gag cct ggg gag Ile Glu Pro Gly Glu 4270	atc gag gtg Ile Glu Val	38371
gtg ctg Val Leu 4275	tgc gag cac ccc gcc Cys Glu His Pro Ala 4280	gtg cac caa gcg cac Val His Gln Ala His 4285	gtg cgg ccc Val Arg Pro	38416
tac gtg Tyr Val 4290	gac agc gcc gga gag Asp Ser Ala Gly Glu 4295	cgg cgc ctg gtg gcc Arg Arg Leu Val Ala 4300	tac gtg gcc Tyr Val Ala	38461
gca cgg Ala Arg	ctc gag gac acg gac Leu Glu Asp Thr Asp	ggg gcg gag aca gag Gly Ala Glu Thr Glu	cac gtg gag His Val Glu	38506

4305	4310	4315	
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acg gcc ttt gac ctg gcc ggg Thr Ala Phe Asp Leu Ala Gly 4335 4340	tgg aat gac agc gtg cgc ggc gag Trp Asn Asp Ser Val Arg Gly Glu 4345	38596	
ccg ctg cct ccg gag cag atg Pro Leu Pro Pro Glu Gln Met 4350 4355	cga gag tgg gtg gag acg aca gtg Arg Glu Trp Val Glu Thr Thr Val 4360	38641	
gag cgg ctc atg gag ctc gtt Glu Arg Leu Met Glu Leu Val 4365 4370	ccc cgg cgg gtg ctg gag ctg ggc Pro Arg Arg Val Leu Glu Leu Gly 4375	38686	
tgt ggc tcc ggg ctc ctg ctc Cys Gly Ser Gly Leu Leu Leu 4380 4385	cgc cgg ctc gcc ccc cgc tgc gag Arg Arg Leu Ala Pro Arg Cys Glu 4390	38731	
tcc tac tgg ggc acg gag ctc Ser Tyr Trp Gly Thr Glu Leu 4395 4400	tcc ccg gta gcc gtc gag cgg ctg Ser Pro Val Ala Val Glu Arg Leu 4405	38776	
agg gag caa ctc cag acg ggc Arg Glu Gln Leu Gln Thr Gly 4410 4415	ggc tcc ccg ctc gcg cag cgc gtg Gly Ser Pro Leu Ala Gln Arg Val 4420	38821	
cgg ctc atg gcc cag ccg gcg Arg Leu Met Ala Gln Pro Ala 4425 4430	gat gac ttc tcc ggg ctt ccg gaa Asp Asp Phe Ser Gly Leu Pro Glu 4435	38866	
gcc ggc ttc gac acc gtc atc Ala Gly Phe Asp Thr Val Ile 4440 4445	ctc aac tcg gtg acg cag ctc ttc Leu Asn Ser Val Thr Gln Leu Phe 4450	38911	
ccc agc gtg gac tac ctg ctg Pro Ser Val Asp Tyr Leu Leu 4455 4460	cgg gtc gtg gag ggc gcg ctg cgc Arg Val Val Glu Gly Ala Leu Arg 4465	38956	
gtg ctc caa ccg ggc gga acc Val Leu Gln Pro Gly Gly Thr 4470 4475	ctg ttc att ggc gac gtg cag aat Leu Phe Ile Gly Asp Val Gln Asn 4480	39001	
ctg cgg ctc ttc gag ctg ttc Leu Arg Leu Phe Glu Leu Phe 4485 4490	cat gcc tcg gtg gcc ctg gag cag His Ala Ser Val Ala Leu Glu Gln 4495	39046	
gcg tca gcg gac ctg gag gcg Ala Ser Ala Asp Leu Glu Ala 4500 4505	cca gcg ctg ctc gcc cgc acc cgc Pro Ala Leu Leu Ala Arg Thr Arg 4510	39091	
cag cgc atg ctg ctg gac gaa Gln Arg Met Leu Leu Asp Glu 4515 4520	cgg ttg tac gtg gac ccg gac ttc Arg Leu Tyr Val Asp Pro Asp Phe 4525	39136	
ttc gcc gcg ctc gcc acg cac Phe Ala Ala Leu Ala Thr His 4530 4535	ttt ccc cag ctg ggc gcg gtc cgg Phe Pro Gln Leu Gly Ala Val Arg 4540	39181	
ctg cac ctc aag cgc ggg agc ggg agg aac gag atg aac cgc ttc		39226	

Leu His 4545	Leu Lys Arg Gly Ser 4550	Gly Arg Asn Glu Met 4555	Asn Arg Phe	
cgc tac Arg Tyr 4560	gac gtg gag ctg cag Asp Val Glu Leu Gln 4565	ctc gcc ccc gta gcg Leu Ala Pro Val Ala 4570	aaa gca ggc Lys Ala Gly	39271
ccc gcg Pro Ala 4575	caa gag ctg cca gag Gln Glu Leu Pro Glu 4580	ctg gac tgg agg cat Leu Asp Trp Arg His 4585	gag ggg ctc Glu Gly Leu	39316
ggc ctg Gly Leu 4590	gaa agg ctg gag cgc Glu Arg Leu Glu Arg 4595	atg ctg gcg gag cga Met Leu Ala Glu Arg 4600	ccg gcg ggg Pro Ala Gly	39361
ctg gtg Leu Val 4605	ctg cgc aat gtg gcc Leu Arg Asn Val Ala 4610	aac gcc cgc acg gcg Asn Ala Arg Thr Ala 4615	gac gag gcg Asp Glu Ala	39406
gca cgg Ala Arg 4620	ctg gcg ctg ctg cgg Leu Ala Leu Leu Arg 4625	act ggc aac agc gtg Thr Gly Asn Ser Val 4630	ggc cgg ctg Gly Arg Leu	39451
cgg gca Arg Ala 4635	ctg ccg gcg gtg aca Leu Pro Ala Val Thr 4640	tcc tgg aat cca gag Ser Trp Asn Pro Glu 4645	cag ctc tgg Gln Leu Trp	39496
agg ctg Arg Leu 4650	gcg gag gca gcc gac Ala Glu Ala Ala Asp 4655	tac acg tgc cac gtc Tyr Thr Cys His Val 4660	acc tgg agc Thr Trp Ser	39541
gcc cag Ala Gln 4665	gac gag gaa ggc cgt Asp Glu Glu Gly Arg 4670	ttc gac gcg ctg ctc Phe Asp Ala Leu Leu 4675	atg gcc cgc Met Ala Arg	39586
gcg gct Ala Ala 4680	ggc tcc tcg cgc ccg Gly Ser Ser Arg Pro 4685	gcg gcc tgg ctg acg Ala Ala Trp Leu Thr 4690	cct ccc ccg Pro Pro Pro	39631
cct ccc Pro Pro 4695	cct cga ccc tgg aag Pro Arg Pro Trp Lys 4700	agc tac gcc aac cag Ser Tyr Ala Asn Gln 4705	ccc ctg gcg Pro Leu Ala	39676
gcc agc Ala Ser 4710	cgc cgg cgc acc ctc Arg Arg Arg Thr Leu 4715	gtg gga gtg ctg cga Val Gly Val Leu Arg 4720	agc cac ctc Ser His Leu	39721
gag cac Glu His 4725	aag ctg ccc gag tac Lys Leu Pro Glu Tyr 4730	atg gtg ccc tct tcc Met Val Pro Ser Ser 4735	ttc gtg ctg Phe Val Leu	39766
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gca ctg Ala Leu 4755	cct ccc ccc gag ccc Pro Pro Pro Glu Pro 4760	gca caa gcc gag caa Ala Gln Ala Glu Gln 4765	acg cca ggc Thr Pro Gly	39856
cac ctc His Leu 4770	gcg ccg cgg acc ccc Ala Pro Arg Thr Pro 4775	acc gag cgc cgg ctt Thr Glu Arg Arg Leu 4780	gcc gag ctg Ala Glu Leu	39901

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Ala Met Leu Ala Val	Pro Leu Pro Glu Ala	Glu Leu Ala Ala Leu	
5535	5540	5545	
ctg ggc agc gag ctg	tgt atc gcc gcg gtg	aac ggg cca ccg gcc	50098
Leu Gly Ser Glu Leu	Cys Ile Ala Ala Val	Asn Gly Pro Arg Ala	
5550	5555	5560	
tgc gtg gcc tcg ggt	cct cta ccg gcg gta	gag gcg ctc acc gcc	50143
Cys Val Ala Ser Gly	Pro Leu Pro Ala Val	Glu Ala Leu Thr Ala	
5565	5570	5575	
gcg ctg gag agc cgg	ggc gtg tcc agc cgg	cgc ctg gag act tcc	50188
Ala Leu Glu Ser Arg	Gly Val Ser Ser Arg	Arg Leu Glu Thr Ser	
5580	5585	5590	
cat gcc ttc cac tct	gcc tcc atg gag gca	tgc cag ggg cca ctc	50233
His Ala Phe His Ser	Ala Ser Met Glu Ala	Cys Gln Gly Pro Leu	
5595	5600	5605	
acc acg ctg ctg cgg	cgc atg cgc ctg cag	gcc cct cgc ctc ccc	50278
Thr Thr Leu Leu Arg	Arg Met Arg Leu Gln	Ala Pro Arg Leu Pro	
5610	5615	5620	
tgt gtc tcc ggc ctc	acc ggc cgg tgg ctc	acc ggc gag gag gcc	50323
Cys Val Ser Gly Leu	Thr Gly Arg Trp Leu	Thr Gly Glu Glu Ala	
5625	5630	5635	
acg gag cct acg tac	tgg gcc cgc cag ctc	cgc gag ccg gta cgt	50368
Leu Glu Pro Thr Tyr	Trp Ala Arg Gln Leu	Arg Glu Pro Val Arg	
5640	5645	5650	
ttc tcc gag gcc ctc	gag acg ctc tgg agc	ctc aag gag cca gtg	50413
Phe Ser Glu Ala Leu	Glu Thr Leu Trp Ser	Leu Lys Glu Pro Val	
5655	5660	5665	
gag gag gag gta ggc	ccc ggc acc acg ctc	acc gcg ctt gcg cgg	50458
Leu Leu Glu Val Gly	Pro Gly Thr Thr Leu	Thr Ala Leu Ala Arg	
5670	5675	5680	

cgg cac ccc acc cgc	ccc gcc cgc acc cag	gag gtg gcg agc ctt	50503
Arg His Pro Thr Arg	Pro Ala Arg Thr Gln	Glu Val Ala Ser Leu	
5685	5690	5695	
ccc gtg caa ccg gac	acg gcc gtg ccg tgc	att gaa gag gcc gtg	50548
Pro Val Gln Pro Asp	Thr Ala Val Pro Cys	Ile Glu Glu Ala Val	
5700	5705	5710	
ggt gag ctg tgg cag	gcc ggc ctg gag ctg	gac tgg agc gcc ctg	50593
Gly Glu Leu Trp Gln	Ala Gly Leu Glu Leu	Asp Trp Ser Ala Leu	
5715	5720	5725	
cac gcc gcg cca cgc	cac cgc gca cac ctt	cca ccc tac ccc ttc	50638
His Ala Ala Pro Arg	His Arg Ala His Leu	Pro Pro Tyr Pro Phe	
5730	5735	5740	
gag cgc cag cgc tac	tgg att gaa ccg gag	gct gcc ccg cag ccg	50683
Glu Arg Gln Arg Tyr	Trp Ile Glu Pro Glu	Ala Ala Pro Gln Pro	
5745	5750	5755	
cgc gcg cag cag ccg	acg ccc gcg tcc ctt	gtg ccc ccg gag cag	50728
Arg Ala Gln Gln Pro	Thr Pro Ala Ser Leu	Val Pro Pro Glu Gln	
5760	5765	5770	
ccc tcg cgc gag gcc	ctg gaa gac tgg ttc	tac gtg ccc acc tgg	50773
Pro Ser Arg Glu Ala	Leu Glu Asp Trp Phe	Tyr Val Pro Thr Trp	
5775	5780	5785	
gag cag gca cct gcc	acg agc ggg ggg gga	cag ccc ctg gcg gcc	50818
Glu Gln Ala Pro Ala	Thr Ser Gly Gly Gly	Gln Pro Leu Ala Gly	
5790	5795	5800	
ccg gtg ctc gcc ttc	atg gac tcc tcg ggc	ctg gcc gag cag gtg	50863
Pro Val Leu Ala Phe	Met Asp Ser Ser Gly	Leu Ala Glu Gln Val	
5805	5810	5815	
ctg gcc gcg ctg tgg	ccc gcg gac tcc ggc	gcg ctc ctc acc cgc	50908
Leu Ala Ala Leu Trp	Pro Ala Asp Ser Gly	Ala Leu Leu Thr Arg	
5820	5825	5830	
gtc gag ccg gcc ggg	cac tat gag caa ctc	agt gag cac gcc ttc	50953
Val Glu Pro Ala Gly	His Tyr Glu Gln Leu	Ser Glu His Ala Phe	
5835	5840	5845	
cgc ctc cgc ccc gag	agc gag gag gac tgg	gac gcg ctc ttc cag	50998
Arg Leu Arg Pro Glu	Ser Glu Glu Asp Trp	Asp Ala Leu Phe Gln	
5850	5855	5860	
gcg ctc cag tcc cag	ggc cgg ctc ccc cgt	cgc atc ctc cat gcc	51043
Ala Leu Gln Ser Gln	Gly Arg Leu Pro Arg	Arg Ile Leu His Ala	
5865	5870	5875	
tgg gct ctc acc gcg	gag ccc ggc ccc tgt	acc ccg gac ggg gaa	51088
Trp Ala Leu Thr Ala	Glu Pro Gly Pro Cys	Thr Pro Asp Gly Glu	
5880	5885	5890	
gcg gtg ctg gaa cag	ggc ttc ttc agc ctg	ctg cgg ctg gcc cgt	51133
Ala Val Leu Glu Gln	Gly Phe Phe Ser Leu	Leu Arg Leu Ala Arg	
5895	5900	5905	
gcg ctc ggc cgc cac	gcg cct gag cgc cct	gta cag ctc gag gtg	51178
Ala Leu Gly Arg His	Ala Pro Glu Arg Pro	Val Gln Leu Glu Val	
5910	5915	5920	

ctg tcc agc ttc gtc	cac gcg gtg ggc ccg	cgg gag ccg ctc gag	51223
Leu Ser Ser Phe Val	His Ala Val Gly Pro	Arg Glu Pro Leu Glu	
5925	5930	5935	
ccg ctc aag gcc acg	ctg ctg ggg gcc tgt	gcg gta ctt ccc ctg	51268
Pro Leu Lys Ala Thr	Leu Leu Gly Ala Cys	Ala Val Leu Pro Leu	
5940	5945	5950	
gag tac cct cac gtg	cag tgc cgc acc att	gac gtg ccg ccc ggg	51313
Glu Tyr Pro His Val	Gln Cys Arg Thr Ile	Asp Val Arg Pro Gly	
5955	5960	5965	
agc gag cca ccg gaa	gtg ctg gtg agg agc	ctg gcc gcc gag ctg	51358
Ser Glu Pro Arg Glu	Val Leu Val Arg Ser	Leu Ala Ala Glu Leu	
5970	5975	5980	
gcc gct ccc atg gga	gag agc ccg gtg gcc	tgg cgc gac ggg cag	51403
Ala Ala Pro Met Gly	Glu Ser Pro Val Ala	Trp Arg Asp Gly Gln	
5985	5990	5995	
cgg tac gtg cgc cgc	gcc acc ccg cag agg	ctc gag gcc tcg ccg	51448
Arg Tyr Val Arg Arg	Ala Thr Arg Gln Arg	Leu Glu Ala Ser Arg	
6000	6005	6010	
ccc ctg cgc agc ctt	cgg gag cga ggc gtg	tac ctg gta gca gga	51493
Pro Leu Arg Ser Leu	Arg Glu Arg Gly Val	Tyr Leu Val Ala Gly	
6015	6020	6025	
ggg ctg ggt gga atc	ggc ctg gtg ctg gcg	cga gcg ctg gcc cag	51538
Gly Leu Gly Gly Ile	Gly Leu Val Leu Ala	Arg Ala Leu Ala Gln	
6030	6035	6040	
cgg gcg cgt gct ccg	ctg gcg cta ctc acc	cac tcg ccc ttc cct	51583
Arg Ala Arg Ala Arg	Leu Ala Leu Leu Thr	His Ser Pro Phe Pro	
6045	6050	6055	
ccc cga gag cag tgg	gag cag tgg ctg gag	gaa gcc ccg gcg cac	51628
Pro Arg Glu Gln Trp	Glu Gln Trp Leu Glu	Glu Ala Pro Ala His	
6060	6065	6070	
ccg gag ccg gcg tgg	cgg agc gag gcc gac	ccc tcg gag cgc cgc	51673
Pro Glu Pro Ala Trp	Arg Ser Glu Ala Asp	Pro Ser Glu Arg Arg	
6075	6080	6085	
agg acc cag cac cgc	atc cgc tgc ctg ctg	gag ctg gag cag ctc	51718
Arg Thr Gln His Arg	Ile Arg Cys Leu Leu	Glu Leu Glu Gln Leu	
6090	6095	6100	
ggc gcc gag gtg cag	gtg tac acg gcg gac	gtg gcg gag gag gcc	51763
Gly Ala Glu Val Gln	Val Tyr Thr Ala Asp	Val Ala Glu Glu Ala	
6105	6110	6115	
gcc gtg cgc tcg gtg	gtg gag cag gtg cac	gcc cgc tgg ggg aag	51808
Ala Val Arg Ser Val	Val Glu Gln Val His	Ala Arg Trp Gly Lys	
6120	6125	6130	
atc gag ggc gtg ctg	cac gcc gcc gcc acg	ttc gac gac ggc gtc	51853
Ile His Gly Val Leu	His Ala Ala Ala Thr	Phe Asp Asp Gly Val	
6135	6140	6145	
acc cag ctc cgc acg	cac gag cag tcc tcg	cgg gcc ctg cgc acc	51898
Ile Gln Leu Arg Thr	His Glu Gln Ser Ser	Arg Ala Leu Arg Thr	

6150	6155	6160	
aag gtg cgg ggc agc Lys Val Arg Gly Ser 6165	atg gtg ctg cac gag Met Val Leu His Glu 6170	gtg ctg gcg agc gag Val Leu Ala Ser Glu 6175	51943
ggg ttg gat tgg ttc Gly Leu Asp Trp Phe 6180	gcc ctg tgc tcc tcg Ala Leu Cys Ser Ser 6185	ctg gcg tcg gcg ctg Leu Ala Ser Ala Leu 6190	51988
ggc tca ttc ggc cag Gly Ser Phe Gly Gln 6195	gcg gac tac tgc gcg Ala Asp Tyr Cys Ala 6200	gcc aat gcc ttc cag Ala Asn Ala Phe Gln 6205	52033
gat gcg tat gcg cac Asp Ala Tyr Ala His 6210	cac ctg cgc cgg cag His Leu Arg Arg Gln 6215	ggc ttc acg gga gcg Gly Phe Thr Gly Ala 6220	52078
ctg gcg ctg gac tgg Leu Ala Leu Asp Trp 6225	ggc acg tgg aga gat Gly Thr Trp Arg Asp 6230	acg ggg gcg gcc atg Thr Gly Ala Ala Met 6235	52123
cgg ctg gtg gca cgc Arg Leu Val Ala Arg 6240	acc cga cgg ggg ggc Thr Arg Arg Gly Gly 6245	cat gag aag ccg ccc His Glu Lys Pro Pro 6250	52168
acg ccg ctc acc cac Thr Pro Leu Thr His 6255	cca ctc ttc gat tgc Pro Leu Phe Asp Cys 6260	gaa cag cgc gag ccg Glu Gln Arg Glu Pro 6265	52213
ggc ggg acg cac tgg Gly Gly Thr His Trp 6270	ctc ggc ctc acg ctg Leu Gly Leu Thr Leu 6275	agg ggt gga gag gac Arg Gly Gly Glu Asp 6280	52258
tgg gtg gtg gac gag Trp Val Val Asp Glu 6285	cac cgg ctg caa ggg His Arg Leu Gln Gly 6290	gtg cca aca ctg ccc Val Pro Thr Leu Pro 6295	52303
ggg gtg gcc tac ctg Gly Val Ala Tyr Leu 6300	gag ctg gcg cgg gcg Glu Leu Ala Arg Ala 6305	gcg tgt gcc cag gcg Ala Cys Ala Gln Ala 6310	52348
ctg ggg gcc gag gcg Leu Gly Ala Glu Ala 6315	gtg gag ctg gcg gag Val Glu Leu Ala Glu 6320	ctg ttg ctg ctg gag Leu Leu Leu Leu Glu 6325	52393
cct ctg acg gta cct Pro Leu Thr Val Pro 6330	cga ggc gaa tcc agg Arg Gly Glu Ser Arg 6335	cag gtc cgg gtg gtg Gln Val Arg Val Val 6340	52438
ctc cag ccc gag ggg Leu Gln Pro Glu Gly 6345	cag gct cat gcc ctg Gln Ala His Ala Leu 6350	cgg gtg gag agc cgg Arg Val Glu Ser Arg 6355	52483
tcg gag gaa gcg cgg Ser Glu Glu Ala Arg 6360	gga tgg aat gag cat Gly Trp Asn Glu His 6365	gcg cgg ggc cgg gtg Ala Arg Gly Arg Val 6370	52528
cgc gcc gtg cct cgg Arg Ala Val Pro Arg 6375	ctg gcc gag cgc atc Leu Ala Glu Arg Ile 6380	cag ccc gag ctg ctg Gln Pro Glu Leu Leu 6385	52573
cgc gcc gcc tgc gaa	cac gag cag ccc gtg	ccc gga gag ccc cag	52618

Arg Ala Ala Cys Glu	His Glu Gln Pro Val	Pro Gly Glu Pro Gln	
6390	6395	6400	
gag caa ggc cct gtc	cac gcc gga gca cgc	tgg cat ggc ctc ttc	52663
Glu Gln Gly Pro Val	His Ala Gly Ala Arg	Trp His Gly Leu Phe	
6405	6410	6415	
cag tgg gtt cgc cgc	ggc cct cgc cag gcc	ctc gcc cag ctc gcg	52708
Gln Trp Val Arg Arg	Gly Pro Arg Gln Ala	Leu Ala Gln Leu Ala	
6420	6425	6430	
cta ccg gag ccc ttc	cac ggt gac ctc gag	cgc ttc gag ctc cac	52753
Leu Pro Glu Pro Phe	His Gly Asp Leu Glu	Arg Phe Glu Leu His	
6435	6440	6445	
ccg gcg ctc atg gac	atg gcc acc agc ttc	gcc att ccc ggc gga	52798
Pro Ala Leu Met Asp	Met Ala Thr Ser Phe	Ala Ile Pro Gly Gly	
6450	6455	6460	
gtg ccc tgg ctc gcc	ttt ggc tat gag cgc	gtg ctc att cac ggt	52843
Val Pro Trp Leu Ala	Phe Gly Tyr Glu Arg	Val Leu Ile His Gly	
6465	6470	6475	
ccg ctg cca ccg cag	gtg ctc agc cac gtg	agc ctg ccc gag gag	52888
Pro Leu Pro Pro Gln	Val Leu Ser His Val	Ser Leu Pro Glu Glu	
6480	6485	6490	
tcg cag gct ggc gcg	caa caa ctc cgg cta	cag gtg cgg ctg ctg	52933
Ser Gln Ala Gly Ala	Gln Gln Leu Arg Leu	Gln Val Arg Leu Leu	
6495	6500	6505	
gat ctg gag ggc tgg	gag cgg gtg cgg atc	gat ggg tac ctg ctg	52978
Asp Leu Glu Gly Trp	Glu Arg Val Arg Ile	Asp Gly Tyr Leu Leu	
6510	6515	6520	
cgg ccg ctg aag ccc	agc gac gcc agt gtc	gag ccg gcg gcg ccc	53023
Arg Pro Leu Lys Pro	Ser Asp Ala Ser Val	Glu Pro Ala Ala Pro	
6525	6530	6535	
aac gtg gaa gtc gcc	gtg ggg acg ccg ggg	ctg ctg gag agc ctt	53068
Asn Val Glu Val Ala	Val Gly Thr Pro Gly	Leu Leu Glu Ser Leu	
6540	6545	6550	
ggc ctg cgc cgc tgc	acc cgc ccc gcc ccc	ggg ccg cgc cag gtg	53113
Gly Leu Arg Arg Cys	Thr Arg Pro Ala Pro	Gly Pro Arg Gln Val	
6555	6560	6565	
gag atc gag gtg gag	gcc gct ggg ctc aac	ttc ctg gac gtg ctg	53158
Glu Ile Glu Val Glu	Ala Ala Gly Leu Asn	Phe Leu Asp Val Leu	
6570	6575	6580	
ggc gcg ctg ggg atg	atg ccg gca ttg gag	gcg gag gag agc gta	53203
Gly Ala Leu Gly Met	Met Pro Ala Leu Glu	Ala Glu Glu Ser Val	
6585	6590	6595	
ctg ggg cgc gag tgc	tcc gga cgc att gcc	gcc gtg ggc gag ggc	53248
Leu Gly Arg Glu Cys	Ser Gly Arg Ile Ala	Ala Val Gly Glu Gly	
6600	6605	6610	
gtc agc ggg ctg cgc	gtg ggg gac gag gtg	ctg gcg gtg gcc cca	53293
Val Ser Gly Leu Arg	Val Gly Asp Glu Val	Leu Ala Val Ala Pro	
6615	6620	6625	

ggc tgc ttc cgc tcc	tac gtg ctg gtg gat	gag agc cag gtg gtg	53338
Gly Cys Phe Arg Ser	Tyr Val Leu Val Asp	Glu Ser Gln Val Val	
6630	6635	6640	
cgc agg ccc gcc tcg	ctg ggg ctc gcc gag	ggg gcg gcc cag atg	53383
Arg Arg Pro Ala Ser	Leu Gly Leu Ala Glu	Gly Ala Ala Gln Met	
6645	6650	6655	
gtg ccg ttc gcc acg	gcg tac ttc gcc ctg	cac acc gtg ggc cgg	53428
Val Pro Phe Ala Thr	Ala Tyr Phe Ala Leu	His Thr Val Gly Arg	
6660	6665	6670	
ttg cgg cgc ggc gag	cgc atc ctc atc cac	gcc gcg gcc gga ggg	53473
Leu Arg Arg Gly Glu	Arg Ile Leu Ile His	Ala Ala Ala Gly Gly	
6675	6680	6685	
ctg ggt ctg gcc gcc	gtt cag ctc gca tcc	cgg acc ggg gcg gag	53518
Leu Gly Leu Ala Ala	Val Gln Leu Ala Ser	Arg Thr Gly Ala Glu	
6690	6695	6700	
ata ttg gcc acc gcg	ggc agt gag cag aag	cgc gag tac ctg cgc	53563
Ile Leu Ala Thr Ala	Gly Ser Glu Gln Lys	Arg Glu Tyr Leu Arg	
6705	6710	6715	
tcg ctc ggc att gct	cac gtg ctg gac tcg	cgc agc acc tcc ttc	53608
Ser Leu Gly Ile Ala	His Val Leu Asp Ser	Arg Ser Thr Ser Phe	
6720	6725	6730	
gtc agc gaa gtg cgc	gag cgc acc ggc ggg	cgt ggg gtg gat gtg	53653
Val Ser Glu Val Arg	Glu Arg Thr Gly Gly	Arg Gly Val Asp Val	
6735	6740	6745	
gtg ctc aac tcg ctg	gcg gga gag ctg ctc	ctg gcg ggc ctg tcc	53698
Val Leu Asn Ser Leu	Ala Gly Glu Leu Leu	Leu Ala Gly Leu Ser	
6750	6755	6760	
gtg ctg gcc ccg cac	ggc cgc ttc ctg gag	ctg ggg aag agg gac	53743
Val Leu Ala Pro His	Gly Arg Phe Leu Glu	Leu Gly Lys Arg Asp	
6765	6770	6775	
ctg tat gcg gac cag	cag gtg ggc ctc cga	acc ctg gcc cga ggg	53788
Leu Tyr Ala Asp Gln	Gln Val Gly Leu Arg	Thr Leu Ala Arg Gly	
6780	6785	6790	
cag act ttc gcc gcc	att gac ttc ggt ccc	cac cac ccg gac ttc	53833
Gln Thr Phe Ala Ala	Ile Asp Phe Gly Pro	His His Pro Asp Phe	
6795	6800	6805	
cga gcg gtg ctc gag	gag gtg gcc acg caa	ctc acc cag ggc cag	53878
Arg Ala Val Leu Glu	Glu Val Ala Thr Gln	Leu Thr Gln Gly Gln	
6810	6815	6820	
ctc gag cca ttg ccc	acc cgc ctc ttc ccc	gcg cgg cag gtg gcc	53923
Leu Glu Pro Leu Pro	Thr Arg Leu Phe Pro	Ala Arg Gln Val Ala	
6825	6830	6835	
gaa gcc ttc agc ttc	atg gcc cgc gcg ctg	cac atc ggt cgc gtc	53968
Glu Ala Phe Ser Phe	Met Ala Arg Ala Leu	His Ile Gly Arg Val	
6840	6845	6850	
gcc gtc tcc atg cag	ggg gcg acg gca ttg	ccc gcg tcc atg act	54013
Ala Val Ser Met Gln	Gly Ala Thr Ala Leu	Pro Ala Ser Met Thr	
6855	6860	6865	

cgg ggc tcc agg ccc	gca ccg gtg gcc gta	cct cct tgg gag gac	54058
Arg Gly Ser Arg Pro	Ala Pro Val Ala Val	Pro Pro Trp Glu Asp	
6870	6875	6880	
ccg cgg ctg gcg ggc	ggc atc tcc tct gaa	gag ggt gcg gag gcc	54103
Pro Arg Leu Ala Gly	Gly Ile Ser Ser Glu	Glu Gly Ala Glu Ala	
6885	6890	6895	
ttc ctg cgc gcg ttg	gag caa ggg gca ccg	cag ctc atc atc tcc	54148
Phe Leu Arg Ala Leu	Glu Gln Gly Ala Pro	Gln Leu Ile Ile Ser	
6900	6905	6910	
ccc cag gac ttc agc	tcg ctg ctg cgc ggc	ctg ggc ggc agc cag	54193
Pro Gln Asp Phe Ser	Ser Leu Leu Arg Gly	Leu Gly Gly Ser Gln	
6915	6920	6925	
ggc gtg cgc gaa aag	gag cgc ctc gtc acc	ggg cgc gcc gcc gcc	54238
Gly Val Arg Glu Lys	Glu Arg Leu Val Thr	Gly Arg Ala Ala Ala	
6930	6935	6940	
gcc gag ccg cag gcc	ttg cca ccc tcc tcg	ctg gag cag ctc atc	54283
Ala Glu Pro Gln Ala	Leu Pro Pro Ser Ser	Leu Glu Gln Leu Ile	
6945	6950	6955	
gag cag gtg tgg cgc	aag cac ctg ggt gtg	gag cgc gtg cag ccc	54328
Glu Gln Val Trp Arg	Lys His Leu Gly Val	Glu Arg Val Gln Pro	
6960	6965	6970	
acg gac agc ttc ttc	cag ctt gga gga gac	tcg ctg ctg ggc atc	54373
Thr Asp Ser Phe Phe	Gln Leu Gly Gly Asp	Ser Leu Leu Gly Ile	
6975	6980	6985	
caa gtg gcg gcg gat	ctc cgc agg cac ctg	ggt gtg gag ctg ccc	54418
Gln Val Ala Ala Asp	Leu Arg Arg His Leu	Gly Val Glu Leu Pro	
6990	6995	7000	
acg gcc acc ctc ttc	agc cac ccc acc ctc	gcc gcg ctg gcc gcg	54463
Thr Ala Thr Leu Phe	Ser His Pro Thr Leu	Ala Ala Leu Ala Ala	
7005	7010	7015	
gct ctg cgg gct cga	cag ggt gag gcc gcg	gct ccc act gcc ccc	54508
Ala Leu Arg Ala Arg	Gln Gly Glu Ala Ala	Ala Pro Thr Ala Pro	
7020	7025	7030	
gcg cca gcg ctc gtg	ccg gat cca gcc gcg	cgc ttc gag cct ttc	54553
Ala Pro Ala Leu Val	Pro Asp Pro Ala Ala	Arg Phe Glu Pro Phe	
7035	7040	7045	
ccc ctc acg gat gtg	cag gaa gcc tac tgg	gtg ggt cgc cgc tcg	54598
Pro Leu Thr Asp Val	Gln Glu Ala Tyr Trp	Val Gly Arg Arg Ser	
7050	7055	7060	
gcc ttc gag ctc ggc	ggc gtc gcc gcc cat	ggc tac ttc gaa atc	54643
Ala Phe Glu Leu Gly	Gly Val Ala Ala His	Gly Tyr Phe Glu Ile	
7065	7070	7075	
gac agc ccg ggg ctg	gag gtg gag cgc ttc	atc caa tgc tgg cgc	54688
Glu Ser Pro Gly Leu	Glu Val Glu Arg Phe	Ile Gln Cys Trp Arg	
7080	7085	7090	
cag ctc ctg cag cgc	cac gac atg ctg cgc	atg gtg gtg ctc ccg	54733
Ser Leu Leu Gln Arg	His Asp Met Leu Arg	Met Val Val Leu Pro	

7095

7100

7105

gat ggg cgg cag cag Asp Gly Arg Gln Gln 7110	gtg ctc gag cag gtg Val Leu Glu Gln Val 7115	ccg gag tac acg ccg Pro Glu Tyr Thr Pro 7120	54778
gag gtg gtg gag ctg Glu Val Val Glu Leu 7125	cgg ggg ctc tcc ccc Arg Gly Leu Ser Pro 7130	cag gag gcc gag tcc Gln Glu Ala Glu Ser 7135	54823
cgc cgg ctc cag ctg Arg Arg Leu Gln Leu 7140	cgt gag cgc atg gcc Arg Glu Arg Met Ala 7145	cac cag gtc ctg cgc His Gln Val Leu Arg 7150	54868
agc gac cgc tgg ccg Ser Asp Arg Trp Pro 7155	ctc ttc gag ctg gtg Leu Phe Glu Leu Val 7160	ctc tgc cgg tac gag Leu Cys Arg Tyr Glu 7165	54913
gga ggc gtc cgc atc Gly Gly Val Arg Ile 7170	cac atg agc atg gat His Met Ser Met Asp 7175	gcc ctg atg ctg gat Ala Leu Met Leu Asp 7180	54958
gcg tgg agt tca gcg Ala Trp Ser Ser Ala 7185	gtg ctt cgg cag gac Val Leu Arg Gln Asp 7190	ttc gcc cag ctg tac Phe Ala Gln Leu Tyr 7195	55003
cac gag ccg ggc cgg His Glu Pro Gly Arg 7200	ccg ctg gag ccg ctg Pro Leu Glu Pro Leu 7205	gcc atc acc ttc cgc Ala Ile Thr Phe Arg 7210	55048
gac tac gtg ctg gcg Asp Tyr Val Leu Ala 7215	gag cgc cgg ctg cgc Glu Arg Arg Leu Arg 7220	gag ggc gag gcc cat Glu Gly Glu Ala His 7225	55093
gag cgc gcc cgc gca Glu Arg Ala Arg Ala 7230	tac tgg tgg gct cgg Tyr Trp Trp Ala Arg 7235	ctg gac acg ctg ccg Leu Asp Thr Leu Pro 7240	55138
cca ccg ccc gag ctg Pro Pro Pro Glu Leu 7245	ccc ctg gtg aag gaa Pro Leu Val Lys Glu 7250	ccc tcg cag ctg gag Pro Ser Gln Leu Glu 7255	55183
cac gcg cgg ttc acc His Ala Arg Phe Thr 7260	cac cgc gag gct cgg His Arg Glu Ala Arg 7265	ctc gag cca cac cgc Leu Glu Pro His Arg 7270	55228
tgg gcc cgg ctc cag Trp Ala Arg Leu Gln 7275	gag cgg gcg cgc gcc Glu Arg Ala Arg Ala 7280	cac ggc ctc acc ccc His Gly Leu Thr Pro 7285	55273
tcg gcc gcc tgc atg Ser Ala Ala Cys Met 7290	gcc gcc ttc gcc gag Ala Ala Phe Ala Glu 7295	gtg ctt gcc cgc tgg Val Leu Ala Arg Trp 7300	55318
agc cgt cac ccg cgc Ser Arg His Pro Arg 7305	ttc acc ctc aac ctc Phe Thr Leu Asn Leu 7310	acc ctc ttc cag cgc Thr Leu Phe Gln Arg 7315	55363
ttg ccc ctg cac ccg Leu Pro Leu His Pro 7320	cag gtg gac gag ctg Gln Val Asp Glu Leu 7325	gtg ggc gac ttc acc Val Gly Asp Phe Thr 7330	55408
tcc ctg gtc ctg ctg	gag gta gag gca cac	gcg gcg agc acc ttc	55453

Ser Leu Val Leu Leu	Glu Val Glu Ala His	Ala Ala Ser Thr Phe	
7335	7340	7345	
gcc gag cgt gcc tcc	cgg ctc cag gca cag	cta tgg cgg gac ctg	55498
Ala Glu Arg Ala Ser	Arg Leu Gln Ala Gln	Leu Trp Arg Asp Leu	
7350	7355	7360	
gag cac ggc agc gtg	agc gcc gtg cag ctc	atc cgc gag ctc gtc	55543
Glu His Gly Ser Val	Ser Ala Val Gln Leu	Ile Arg Glu Leu Val	
7365	7370	7375	
cgc acc ggc cgc cgc	tcc ccg ggc gcc atc	atg ccc gtc gtc ttc	55588
Arg Thr Gly Arg Arg	Ser Pro Gly Ala Ile	Met Pro Val Val Phe	
7380	7385	7390	
acc agc atc ctc agc	ctg gat gcg cgg cgc	ggc ccc cag ggc agc	55633
Thr Ser Ile Leu Ser	Leu Asp Ala Arg Arg	Gly Pro Gln Gly Ser	
7395	7400	7405	
ctc tcc ttc ttc gag	gga gaa ctg gtg tac	agc atc agc cag act	55678
Leu Ser Phe Phe Glu	Gly Glu Leu Val Tyr	Ser Ile Ser Gln Thr	
7410	7415	7420	
ccc cag gtg tgg ctg	gac cac gga gtc cac	gag gag gag ggg gcg	55723
Pro Gln Val Trp Leu	Asp His Gly Val His	Glu Glu Glu Gly Ala	
7425	7430	7435	
ctc gtc ctg gcg tgg	gac tcg gtg gag gcg	ctc ttc cct ccg ggc	55768
Leu Val Leu Ala Trp	Asp Ser Val Glu Ala	Leu Phe Pro Pro Gly	
7440	7445	7450	
atg gtg gac gac atg	ttc cac gcc tac cag	cgg ctg ctg ggg gca	55813
Met Val Asp Asp Met	Phe His Ala Tyr Gln	Arg Leu Leu Gly Ala	
7455	7460	7465	
ctc gcc gag gag gag	caa gcg tgg gag ggc	gag ctg ccg gag ctg	55858
Leu Ala Glu Glu Glu	Gln Ala Trp Glu Gly	Glu Leu Pro Glu Leu	
7470	7475	7480	
ctg cct cct gcc cag	cgt gag ttg ctc gcg	cgc tac aac gcc acc	55903
Leu Pro Pro Ala Gln	Arg Glu Leu Leu Ala	Arg Tyr Asn Ala Thr	
7485	7490	7495	
cag gcg ccg cgg ccc	agc gga cgg ctg gag	gag ggc ttc ttc acc	55948
Gln Ala Pro Arg Pro	Ser Gly Arg Leu Glu	Glu Gly Phe Phe Thr	
7500	7505	7510	
cag gcg cgg ctc cac	ccc gag ctc ccc gcg	ctg ctc gca ccg gag	55993
Gln Ala Arg Leu His	Pro Glu Leu Pro Ala	Leu Leu Ala Pro Glu	
7515	7520	7525	
cgc acc ctg agc tac	ggc gag ctg gca agg	cga gcc cag gcg ctg	56038
Arg Thr Leu Ser Tyr	Gly Glu Leu Ala Arg	Arg Ala Gln Ala Leu	
7530	7535	7540	
gcc gcg cgc cta cgc	gag ctg gag gtg cag	cct cag gag ttg gtg	56083
Ala Ala Arg Leu Arg	Glu Leu Glu Val Gln	Pro Gln Glu Leu Val	
7545	7550	7555	
gcc att gcc atg cac	aag ggc tgg gag cag	gcc acc gcc gtg ctc	56128
Ala Ile Ala Met His	Lys Gly Trp Glu Gln	Ala Thr Ala Val Leu	
7560	7565	7570	

ggc gtg ctg cag gcg	gcc gcg gcc tac ctg	ccg ttg gat cca gag	56173
Gly Val Leu Gln Ala	Ala Ala Ala Tyr Leu	Pro Leu Asp Pro Glu	
7575	7580	7585	
cag ccg ccg ctc cgg	ctc cac cag ctc ctg	gag gag ggg ccc gcc	56218
Gln Pro Pro Leu Arg	Leu His Gln Leu Leu	Glu Glu Gly Pro Ala	
7590	7595	7600	
cgc gtg gtg ctc acc	cag tcc tcc ttg ctg	cac acc gtg ccc tgg	56263
Arg Val Val Leu Thr	Gln Ser Ser Leu Leu	His Thr Val Pro Trp	
7605	7610	7615	
ccg ccg ggt gtg cag	gtg atc gcc gtg gac	gaa ctc gag cct gca	56308
Pro Pro Gly Val Gln	Val Ile Ala Val Asp	Glu Leu Glu Pro Ala	
7620	7625	7630	
acc gag gcc ccc ccg	cta ccg cct cgc ggt	aca ccg gag cac ctc	56353
Thr Glu Ala Pro Pro	Leu Pro Pro Arg Gly	Thr Pro Glu His Leu	
7635	7640	7645	
gcc tac gtc atc tat	acc tcc ggc tcc acc	ggc aaa ccc aag ggt	56398
Ala Tyr Val Ile Tyr	Thr Ser Gly Ser Thr	Gly Lys Pro Lys Gly	
7650	7655	7660	
gtg gcc att gaa cac	cgg gcc gcg ctc aac	acc gtg gtg gac ctc	56443
Val Ala Ile Glu His	Arg Ala Ala Leu Asn	Thr Val Val Asp Leu	
7665	7670	7675	
aac acc cgc ttt ggc	gtc ggc ccg gag gat	cgg gtg ctg ggc ctg	56488
Asn Thr Arg Phe Gly	Val Gly Pro Glu Asp	Arg Val Leu Gly Leu	
7680	7685	7690	
tcc gcg ctc acc ttc	gac ctg tcg gtg tac	gac gtg ctg ggg ctg	56533
Ser Ala Leu Thr Phe	Asp Leu Ser Val Tyr	Asp Val Leu Gly Leu	
7695	7700	7705	
ctc ggc gcg ggc gga	gcg ctg gtg ctg ccc	gcg gcg gag gcg gag	56578
Leu Gly Ala Gly Gly	Ala Leu Val Leu Pro	Ala Ala Glu Ala Glu	
7710	7715	7720	
aag gat ccc gcc cac	tgg tgg gag cgg ctg	gtg gct ggg cgg gtc	56623
Lys Asp Pro Ala His	Trp Trp Glu Arg Leu	Val Ala Gly Arg Val	
7725	7730	7735	
acg gtg tgg aac tcc	acc ccg gcg ctg atg	ctg ctg ctg gtg gag	56668
Thr Val Trp Asn Ser	Thr Pro Ala Leu Met	Leu Leu Leu Val Glu	
7740	7745	7750	
tac gcc gag cag cgc	ggg ctg aag ctg ccc	gcg gcg ctg cgc ctg	56713
Tyr Ala Glu Gln Arg	Gly Leu Lys Leu Pro	Ala Ala Leu Arg Leu	
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gtc atg ctc agc ggc	gac tgg atc ccc gtg	gcg cta ccg gat cgc	56758
Val Met Leu Ser Gly	Asp Trp Ile Pro Val	Ala Leu Pro Asp Arg	
7770	7775	7780	
atc cgc gca ctc ggc	agg gac gtg cag gtg	gtg agc ctg gga ggc	56803
Ile Arg Ala Leu Gly	Arg Asp Val Gln Val	Val Ser Leu Gly Gly	
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gcc acc gag gct tcc	atc tgg tcc att gcc	tac ccc att ggc cag	56848
Ala Thr Glu Ala Ser	Ile Trp Ser Ile Ala	Tyr Pro Ile Gly Gln	
7800	7805	7810	

gtg gca ccg cag tgg Val Ala Pro Gln Trp 7815	aag agc att ccc tat Lys Ser Ile Pro Tyr 7820	ggc atg ccg ctg gcc Gly Met Pro Leu Ala 7825	56893
aat cag cga ttc cac Asn Gln Arg Phe His 7830	gtg ctg gac ggg cgg Val Leu Asp Gly Arg 7835	ctg gag gca cgg ccc Leu Glu Ala Arg Pro 7840	56938
tgg tgg gtg ccg ggc Trp Trp Val Pro Gly 7845	gag ctg tac att ggc Glu Leu Tyr Ile Gly 7850	ggc gag ggg ctg gca Gly Glu Gly Leu Ala 7855	56983
cgc gag tac tgg agg Arg Glu Tyr Trp Arg 7860	gat gag ccg ctc acc Asp Glu Pro Leu Thr 7865	gca acg cgc ttc atc Ala Thr Arg Phe Ile 7870	57028
cgt cac ccg cgc aca Arg His Pro Arg Thr 7875	ggc gag cgg ctg tac Gly Glu Arg Leu Tyr 7880	cgc acc ggg gac caa Arg Thr Gly Asp Gln 7885	57073
ggg cgc atg ctg ccc Gly Arg Met Leu Pro 7890	gaa ggg agc atc gag Glu Gly Ser Ile Glu 7895	ttc ctc ggc cgg gag Phe Leu Gly Arg Glu 7900	57118
gat ctg cag gtc aag Asp Leu Gln Val Lys 7905	gtg cag ggc ttc cgc Val Gln Gly Phe Arg 7910	gtg gag ctg ggg gag Val Glu Leu Gly Glu 7915	57163
att gaa gcg gcg ctg Ile Glu Ala Ala Leu 7920	gcc cag cac ccg gcg Ala Gln His Pro Ala 7925	cta tcg gcg agc gtg Leu Ser Ala Ser Val 7930	57208
gtg gtg gca cga gga Val Val Ala Arg Gly 7935	gag cct cgg gga gtg Glu Pro Arg Gly Val 7940	cgg cgg ctg gtg gcc Arg Arg Leu Val Ala 7945	57253
tac gcg gtt cct cgc Tyr Ala Val Pro Arg 7950	tcg ggt cag acg ccc Ser Gly Gln Thr Pro 7955	gcg gca ggc gag ctg Ala Ala Gly Glu Leu 7960	57298
cgc cgc tac ctg gcg Arg Arg Tyr Leu Ala 7965	gag cgg cta ccc gcg Glu Arg Leu Pro Ala 7970	tac atg gtg ccc tcc Tyr Met Val Pro Ser 7975	57343
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atc gcc cga gat cag Ile Ala Arg Asp Gln 7995	ctc ccc gag ccg cag Leu Pro Glu Pro Gln 8000	cag aca cag gga ctg Gln Thr Gln Gly Leu 8005	57433
gct gca cag gcc gcg Ala Ala Gln Ala Ala 8010	gcg gcc gac ccg ctc Ala Ala Asp Pro Leu 8015	gtg gag cgg ctg gca Val Glu Arg Leu Ala 8020	57478
gcc ctg gtg aaa gag Ala Leu Val Lys Glu 8025	gcg ctg agg ctc gag Ala Leu Arg Leu Glu 8030	cgc gtg gag ccc cag Arg Val Glu Pro Gln 8035	57523
gac agc ctg ctg gac Asp Ser Leu Leu Asp	ctg ggg gcg gac tcg Leu Gly Ala Asp Ser	gtg gcg ctc atc cgc Val Ala Leu Ile Arg	57568

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8055	8060	8065	
gcc gac atc tac gag Ala Asp Ile Tyr Glu	aac ccc acc gtg Asn Pro Thr Val Gln	ggg ctc gcc acg ctc Gly Leu Ala Thr Leu	57658
8070	8075	8080	
cac caa gag aag aca His Gln Glu Lys Thr	aag agc cag gga gag Lys Ser Gln Gly Glu	gga ggc gct ccg cgg Gly Gly Ala Pro Arg	57703
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8100	8105	8110	
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8130	8135	8140	
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8145	8150	8155	
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8160	8165	8170	
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8175	8180	8185	
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8190	8195	8200	
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8250	8255	8260	
gtg gag ccg gta tac Val Glu Pro Val Tyr	gcc gaa cat gcc ctg Ala Glu His Ala Leu	cac ttc gcc acg ctg His Phe Ala Thr Leu	58243
8265	8270	8275	
gag gca ggg ctg atg	acc cag ctt ctc gat	ctg ggc gcg gct ccc	58288

Glu Ala Gly Leu Met	Thr Gln Leu Leu Asp	Leu Gly Ala Ala Pro	
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agt ggg ctg ggg ctg	tgc cat atc ggc gac	ctg gac ttc gcc cag	58333
Ser Gly Leu Gly Leu	Cys His Ile Gly Asp	Leu Asp Phe Ala Gln	
8295	8300	8305	
gcg cgg ggg ctc ttc	cac ttg gag gag gag	cac gtg ctg ctg cac	58378
Ala Arg Gly Leu Phe	His Leu Glu Glu Glu	His Val Leu Leu His	
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Ser Leu Val Gly Gly	Val Leu Pro Thr Arg	Gly Gln Glu Ala Ala	
8325	8330	8335	
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Ser Val Pro Ala Glu	Gly Gly Thr Glu Ala	Arg Gln Leu Ala Gln	
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Leu Leu Gln Gln Val	Lys Thr Leu Thr Pro	Glu Ala Ala Arg Ala	
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 Val Gly Val Phe Ala Ser Ala Ser Leu Asn Ser Tyr Tyr Leu His
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 Ser Leu His Gly Asn Ala Arg Leu Arg Glu Val Leu Gly Asp Phe
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 Gln Leu Ala Ile Ala Asn Asp Lys Asp Phe Leu Pro Thr Arg Val
 8530 8535 8540

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gcg gca Ala Ala 8740	gcg ggc atc gcc agc Ala Gly Ile Ala Ser 8745	ctg atc aag gcc gtg Leu Ile Lys Ala Val 8750	ctg gtg ctg Leu Val Leu	63224
gag cgc Glu Arg 8755	cgc cag ctc ccg cca Arg Gln Leu Pro Pro 8760	tgc ccg cac ttc acc Cys Pro His Phe Thr 8765	tcc ccc aac Ser Pro Asn	63269
cca cgc Pro Arg 8770	atc gac ttc gag cgc Ile Asp Phe Glu Arg 8775	agc ccc ttc tac gtg Ser Pro Phe Tyr Val 8780	agc ggg cgg Ser Gly Arg	63314

ggg cag Gly Gln 8785	ccg tgg gag ccg gtg Pro Trp Glu Pro Val 8790	gac ggc ccg cgg cgc Asp Gly Pro Arg Arg 8795	gcg ggc gtc Ala Gly Val	63359
agc tcc Ser Ser 8800	ttc ggt att ggt ggc Phe Gly Ile Gly Gly 8805	acc aac gtg cat gtg Thr Asn Val His Val 8810	gtg ctg gag Val Leu Glu	63404
gag gcg Glu Ala 8815	ccg ccc cgg ccg gcg Pro Pro Arg Pro Ala 8820	ccg cgg cgg gca gcg Pro Arg Arg Ala Ala 8825	cgg ccc tac Arg Pro Tyr	63449
cag ctc Gln Leu 8830	ctg ccg ctg tca gca Leu Pro Leu Ser Ala 8835	cgc acg gag cgc gcc Arg Thr Glu Arg Ala 8840	cgg gag gag Arg Glu Glu	63494
gtc gag Val Glu 8845	gcc cgg ctg cgc gag Ala Arg Leu Arg Glu 8850	cac ctg cgc cag cag His Leu Arg Gln Gln 8855	ccc cag gag Pro Gln Glu	63539
ccg ctg Pro Leu 8860	gag gag gtg gcc cac Glu Glu Val Ala His 8865	acg ctc cag gta ggc Thr Leu Gln Val Gly 8870	cgc cgc cac Arg Arg His	63584
atg gcc Met Ala 8875	tgg cgc aca gcg ctg Trp Arg Thr Ala Leu 8880	gtg agc agc agc cct Val Ser Ser Ser Pro 8885	gcc cag gcg Ala Gln Ala	63629
gta gag Val Glu 8890	ctg ctg gag agg cgc Leu Leu Glu Arg Arg 8895	cga ccc gag gcg ctg Arg Pro Glu Ala Leu 8900	ctg cgt ggc Leu Arg Gly	63674
cag agt Gln Ser 8905	gcg gcc cag gcc cgc Ala Ala Gln Ala Arg 8910	tcc gtg gcc ttc ctt Ser Val Ala Phe Leu 8915	cta ccg ggc Leu Pro Gly	63719
cag ggc Gln Gly 8920	tca cag tac gtg ggc Ser Gln Tyr Val Gly 8925	atg gga gcg gcg ctc Met Gly Ala Ala Leu 8930	cat gag tcc His Glu Ser	63764
gag gcg Glu Ala 8935	ccc ttc cgt gaa cag Pro Phe Arg Glu Gln 8940	gtg gat ctc tgt gcc Val Asp Leu Cys Ala 8945	ggg aaa ctc Gly Lys Leu	63809
cag ggc Gln Gly 8950	gtg ctc ggg ttg gac Val Leu Gly Leu Asp 8955	gtg cgc cgc ctg ctg Val Arg Arg Leu Leu 8960	tac cct ggc Tyr Pro Gly	63854
ccg cgg Pro Arg 8965	gag cgg gaa tgg gcc Glu Arg Glu Trp Ala 8970	cag gag cgc ctg cgg Gln Glu Arg Leu Arg 8975	gag acg cgg Glu Thr Arg	63899
gta tgc Val Cys 8980	cag ccg gtg ctc ttc Gln Pro Val Leu Phe 8985	acc gtg gag tac gcg Thr Val Glu Tyr Ala 8990	ctg gcc cga Leu Ala Arg	63944
ctg ctg Leu Leu 8995	gag gcc tgg ggg ata Glu Ala Trp Gly Ile 9000	cgc ccc acc gcg ctg Arg Pro Thr Ala Leu 9005	ttg ggc cac Leu Gly His	63989
agc ctg Ser Leu	ggc gaa tat gtg gcc Gly Glu Tyr Val Ala	gcg tgc ctc gcg ggc Ala Cys Leu Ala Gly	gtg ttc tcc Val Phe Ser	64034

9010	9015	9020	
ctg gaa gag gcg ctg gag gtg Leu Glu Glu Ala Leu Glu Val 9025	gtg gcc gca cgt gga Val Ala Ala Arg Gly 9030	cag ctc atg Gln Leu Met 9035	64079
ggc agc atg ccc ccg ggg ggc Gly Ser Met Pro Pro Gly Gly 9040	atg ctc gcc gtg Met Leu Ala Val 9045	ggg ctc cca gcc Gly Leu Pro Ala 9050	64124
cag gaa gtg gaa ccg ctc cta Gln Glu Val Glu Pro Leu Leu 9055	ccc gcg gca ctg gcc Pro Ala Ala Leu Ala 9060	ctg gcc gcg Leu Ala Ala 9065	64169
cac aac agc ccc cag gcc tgt His Asn Ser Pro Gln Ala Cys 9070	gtg gtg gcg ggc Val Val Ala Gly 9075	ccc acc gag ccc Pro Thr Glu Pro 9080	64214
ctg gcc gag ctg cgc gca cga Leu Ala Glu Leu Arg Ala Arg 9085	ctc gag cag cgg Leu Glu Gln Arg 9090	ggc atc gcg tgc Gly Ile Ala Cys 9095	64259
acg cct ctg gct gtc tct cac Thr Pro Leu Ala Val Ser His 9100	gcc ttc cac tcg ccg Ala Phe His Ser 9105	atg atg gag Met Met Glu 9110	64304
ccg gcg gtg gcc cca ttc gtc Pro Ala Val Ala Pro Phe Val 9115	gcc cgg ctg cgc cgg Ala Arg Leu Arg 9120	atg cat ctg Met His Leu 9125	64349
cgg cct ccg agc ctg ccc ttc Arg Pro Pro Ser Leu Pro Phe 9130	atc tcc aat gtg act Ile Ser Asn Val Thr 9135	ggc acc tgg Gly Thr Trp 9140	64394
ata gag gcc gag gag gcg acc Ile Glu Ala Glu Glu Ala Thr 9145	tca ccg gag tac tgg Ser Pro Glu Tyr Trp 9150	ggc cgg cac Gly Arg His 9155	64439
ctg ctg cag ccg gtg cgc ttt Leu Leu Gln Pro Val Arg Phe 9160	gcc cag ggg ctg gag Ala Gln Gly Leu Glu 9165	cgg ttg tgc Arg Leu Cys 9170	64484
gag ggt gtg cag ccg cgg ctg Glu Gly Val Gln Pro Arg Leu 9175	ctg ttg gaa gtg ggg Leu Leu Glu Val Gly 9180	ccg ggc cac Pro Gly His 9185	64529
aca ctg ggg cgg ctg gcg gcg Thr Leu Gly Arg Leu Ala Ala 9190	cgc caa agc tcc ggc Arg Gln Ser Ser Gly 9195	ccc gtg cag Pro Val Gln 9200	64574
gtg gtg tcc acg ctg ggc tcc Val Val Ser Thr Leu Gly Ser 9205	agc cgg gag gaa agc Ser Arg Glu Glu Ser 9210	tcg gag gtg Ser Glu Val 9215	64619
gag cgg ctg ctg acg gca atc Glu Arg Leu Leu Thr Ala Ile 9220	ggg cga ctg tgg gtg Gly Arg Leu Trp Val 9225	gag gga gcc Glu Gly Ala 9230	64664
gag gtg gac tgg gct ggg ctc Glu Val Asp Trp Ala Gly Leu 9235	cac cgc ggc gaa cgc His Arg Gly Glu Arg 9240	cgg agg cgc Arg Arg Arg 9245	64709
gcg gtg cta ccc acc tac cct 9250	ttt gag cac cag cgc 9255	tac tgg gtg 9260	64754

Ala Val 9250	Leu Pro Thr Tyr Pro 9255	Phe Glu His Gln Arg 9260	Tyr Trp Val	
gag aca Glu Thr 9265	gcc ccc cag cct tcc Ala Pro Gln Pro Ser 9270	cct ccc gag cgg cct Pro Pro Glu Arg Pro 9275	ggg aca cct Gly Thr Pro	64799
gcc gag Ala Glu 9280	agc cct gtc acc agc Ser Pro Val Thr Ser 9285	agc ttc tac gtg cca Ser Phe Tyr Val Pro 9290	ggt tgg agc Gly Trp Ser	64844
cgc gcg Arg Ala 9295	gct ctg ccc tcg gcg Ala Leu Pro Ser Ala 9300	gcc ccc tcg aga cgg Ala Pro Ser Arg Arg 9305	gtg ggc cgg Val Gly Arg	64889
ctg ctg Leu Leu 9310	ttg ttg gcg gag gcc Leu Leu Ala Glu Ala 9315	cat ggg tgg agc cag His Gly Trp Ser Gln 9320	ggg ctc gcg Gly Leu Ala	64934
gag cgg Glu Arg 9325	ctc cgg gcc cgg gga Leu Arg Ala Arg Gly 9330	cac tcc gtc acc ctc His Ser Val Thr Leu 9335	gtc gag cca Val Glu Pro	64979
ggt gag Gly Glu 9340	cgg ctc gag cgc ctg Arg Leu Glu Arg Leu 9345	acc ccg gag cac tgg Thr Pro Glu His Trp 9350	cgc ctg ccc Arg Leu Pro	65024
ccg ggc Pro Gly 9355	cgc cgc gag gac ttc Arg Arg Glu Asp Phe 9360	caa cgc ctg ctg gag Gln Arg Leu Leu Glu 9365	gac tcc gga Asp Ser Gly	65069
gag ctg Glu Leu 9370	ccc tcg agg gtg ctc Pro Ser Arg Val Leu 9375	cac ctc tgg ctg ctg His Leu Trp Leu Leu 9380	ggg agc agc Gly Ser Ser	65114
cag agc Gln Ser 9385	ccc cag gag cgc ggc Pro Gln Glu Arg Gly 9390	ttc tac acc ctg ctg Phe Tyr Thr Leu Leu 9395	gcg ctg gcc Ala Leu Ala	65159
cag gca Gln Ala 9400	ctg gga gcc cac ggc Leu Gly Ala His Gly 9405	acc cgg ccc gcg gtg Thr Arg Pro Ala Val 9410	gag ctc acg Glu Leu Thr	65204
gtg gtg Val Val 9415	acc gat cag ctc tac Thr Asp Gln Leu Tyr 9420	gcg gtg gca gag ggc Ala Val Ala Glu Gly 9425	gag ccg ata Glu Pro Ile	65249
cag ccg Gln Pro 9430	ctc aag gcg ctc ctg Leu Lys Ala Leu Leu 9435	cag ggc cct gct tcc Gln Gly Pro Ala Ser 9440	gtg ctt ccc Val Leu Pro	65294
cag gaa Gln Glu 9445	ctc ccc ggg tgc acg Leu Pro Gly Cys Thr 9450	tgc cgc ctc gtg gac Cys Arg Leu Val Asp 9455	atg gcc ctg Met Ala Leu	65339
ccg cca Pro Pro 9460	ggc ggc gtg gcg gag Gly Gly Val Ala Glu 9465	gag ctg ctg gag cgg Glu Leu Leu Glu Arg 9470	ctg gtg gcg Leu Val Ala	65384
gag ctc Glu Val 9475	gag tcc acc gcg tcc Glu Ser Thr Ala Ser 9480	gaa cgc tcg gtg gcg Glu Arg Ser Val Ala 9485	tac cgc ggc Tyr Arg Gly	65429

gcg gct Ala Ala 9490	cgc tgg gtg cgc gag Arg Trp Val Arg Glu 9495	ttc gtc ccc gtg ccg Phe Val Pro Val Pro 9500	ctg ccc ccg Leu Pro Pro	65474
ccc gag Pro Glu 9505	cct tcg cag ctc ccg Pro Ser Gln Leu Pro 9510	ctt cgg cag aga ggg Leu Arg Gln Arg Gly 9515	gtg tat ttg Val Tyr Leu	65519
att gtc Ile Val 9520	ggc ggc ctg ggg ggc Gly Gly Leu Gly Gly 9525	gta ggg ctc gcg ctg Val Gly Leu Ala Leu 9530	gca gag cac Ala Glu His	65564
ctg gcg Leu Ala 9535	cgg cgc gtg tcg gcg Arg Arg Val Ser Ala 9540	cgg ctg gtg ctc acg Arg Leu Val Leu Thr 9545	ggc cgc tcg Gly Arg Ser	65609
ccc acg Pro Thr 9550	cca ccg cgc gag agc Pro Pro Arg Glu Ser 9555	tgg agc gca tgg ctg Trp Ser Ala Trp Leu 9560	ggc act ccc Gly Thr Pro	65654
acg cgg Thr Arg 9565	ctg cgg ctc tca cag Leu Arg Leu Ser Gln 9570	gag ctc gag tgg ctg Glu Leu Glu Trp Leu 9575	cgc ggt gcc Arg Gly Ala	65699
gcc gag Ala Glu 9580	cag atc gag cac cag Gln Ile Glu His Gln 9585	cgg ccc ctg ctc tcc Arg Pro Leu His Ser 9590	ctg gcc gac Leu Ala Asp	65744
agt ccc Ser Pro 9595	ggc ctg gaa gag tcg Gly Leu Glu Glu Ser 9600	ctg cgc ctg ctg tgc Leu Arg Leu Leu Cys 9605	gcc agc tac Ala Ser Tyr	65789
ctc tac Leu Tyr 9610	cac ttt ctc ttc cct His Phe Leu Phe Pro 9615	ctt cag gcg cct ctg Leu Gln Ala Pro Leu 9620	aga ctt gga Arg Leu Gly	65834
gag ccg Glu Pro 9625	agg gcg atg cag gca Arg Ala Met Gln Ala 9630	ttg cgt gag cgc ctg Leu Arg Glu Arg Leu 9635	ggg ctg cag Gly Leu Gln	65879
ccc ggc Pro Gly 9640	ttc gag cgc ctc ttc Phe Glu Arg Leu Phe 9645	tcc ttc atg atc ggc Ser Phe Met Ile Gly 9650	acc ctg gag Thr Leu Glu	65924
cag gcg Gln Ala 9655	aag ctg att cga gtg Lys Leu Ile Arg Val 9660	gga gag ggc atg ctc Gly Glu Gly Met Leu 9665	gag ggt cag Glu Gly Gln	65969
gtg gag Val Glu 9670	cca gcc cac gtg ccc Pro Ala His Val Pro 9675	aca cct cga gca ctg Thr Pro Arg Ala Leu 9680	cac gag cga His Glu Arg	66014
ctg ctc Leu Leu 9685	gaa ggc tac ccg gag Glu Gly Tyr Pro Glu 9690	gtg tca ggc ctg ctg Val Ser Gly Leu Leu 9695	gag ctg ctt Glu Leu Leu	66059
gag cat Glu His 9700	tgt gtg cgc cac tac Cys Val Arg His Tyr 9705	cct gag gtg ctc cga Pro Glu Val Leu Arg 9710	ggg agc ctg Gly Ser Leu	66104
ccg gcc Pro Ala 9715	ctc agt gtg ctc tac Leu Ser Val Leu Tyr 9720	ccc tcg ggc cgc tcc Pro Ser Gly Arg Ser 9725	gag gag gac Glu Glu Asp	66149

tcc gca Ser Ala 9730	cga agc ggg gtc Arg Ser Gly Val 9735	gag Glu 9735	tgg agc agc atg Trp Ser Ser Met 9740	ggg Gly 9740	cag tgc gtg Gln Cys Val	66194
gcg ctg Ala Leu 9745	ctg cgg cat ttc Leu Arg His Phe 9750	ctc Leu 9750	gcc cgc cat Ala Arg His 9755	gcc gag Ala Glu 9755	cgc acg cag Arg Thr Gln	66239
ggg cgt Gly Arg 9760	acc ctg cgc atc Thr Leu Arg Ile 9765	ctc Leu 9765	gag gtg ggc ggc Glu Val Gly Gly 9770	ggc Gly 9770	agt ggc gtg Ser Gly Val	66284
gtg ctc Val Leu 9775	cag gcc ctg ctg Gln Ala Leu Leu 9780	ccg Pro 9780	ctg ctg cgg cac Leu Leu Arg His 9785	cac His 9785	ccg gtg gag Pro Val Glu	66329
tac cac Tyr His 9790	ttc acg gat att Phe Thr Asp Ile 9795	ggc Gly 9795	ccc tcc ttc gtc Pro Ser Phe Val 9800	cgc Arg 9800	gcc atg gag Ala Met Glu	66374
gga gtc Gly Val 9805	ggc cgc cgc cag Gly Arg Arg Gln 9810	ggc Gly 9810	ctc acc ttc ctc Leu Thr Phe Leu 9815	cac His 9815	acc tcg gtg Thr Ser Val	66419
ctg gac Leu Asp 9820	atc tcc cgc cct Ile Ser Arg Pro 9825	ccc Pro 9825	cca gag cag ggc Pro Glu Gln Gly 9830	cat His 9830	ccg cct ggc Pro Pro Gly	66464
tcg tat Ser Tyr 9835	gat ctg gtg att Asp Leu Val Ile 9840	gcc Ala 9840	ctc aac gtg gtg Leu Asn Val Val 9845	cac His 9845	gcc acc ccg Ala Thr Pro	66509
cgc gtt Arg Val 9850	cct cag tcc ctg Pro Gln Ser Leu 9855	gcc Ala 9855	cac ctc gag agc His Leu Glu Ser 9860	ctg Leu 9860	ctc gtc cca Leu Val Pro	66554
ggc ggc Gly Gly 9865	cac ctg tgc ctg His Leu Cys Leu 9870	gtg Val 9870	gag acg gtg aag Glu Thr Val Lys 9875	cag Gln 9875	cag ccc tgg Gln Pro Trp	66599
gtg gac Val Asp 9880	atg atc tgg ggt Met Ile Trp Gly 9885	ttg Leu 9885	gcc gag ggg tgg Ala Glu Gly Trp 9890	tgg Trp 9890	agc tac gag Ser Tyr Glu	66644
gac gag Asp Glu 9895	ctg cgc acc cgc Leu Arg Thr Arg 9900	tct Ser 9900	ccc ttg ctg gag Pro Leu Leu Glu 9905	gta Val 9905	ggc gac tgg Gly Asp Trp	66689
gag cac Glu His 9910	gcc ctg cgc gac Ala Leu Arg Asp 9915	gtg Val 9915	ggc ttt gcc gag Gly Phe Ala Glu 9920	gtg Val 9920	gag gtg ctg Glu Val Leu	66734
cca gcg Pro Ala 9925	gcc gtg gag cag Ala Val Glu Gln 9930	cgc Arg 9930	tca cgc tgg gac Ser Arg Trp Asp 9935	aac Asn 9935	gtg ctc ctc Val Leu Leu	66779
att gcc Ile Ala 9940	cag cgg ccc ggc Gln Arg Pro Gly 9945	gag Glu 9945	agc ggg ctt cag Ser Gly Leu Gln 9950	cca Pro 9950	gtg ggc ggg Val Gly Gly	66824
cgc gcg Arg Ala 9950	gcc atg cag gag Ala Met Gln Glu 9955	cgg Arg 9955	atc cgc cgg ctg Ile Arg Arg Leu 9960	cgg Arg 9960	gcc att gaa Ala Ile Glu	66869

9955	9960	9965	
gaa gcg Glu Ala 9970	gga ggc gag gtg ctg Gly Gly Glu Val Leu 9975	ccc ctg gtg gcg gac Pro Leu Val Ala Asp 9980	gtc acc gat Val Thr Asp 66914
cgg gag Arg Glu 9985	cgc atg ggc gag gtg Arg Met Gly Glu Val 9990	ctc gcc gag gtg aag Leu Ala Glu Val Lys 9995	cgc cgc cat Arg Arg His 66959
ggg gcg Gly Ala 10000	ctc cat ggg gtg atc Leu His Gly Val Ile 10005	cac gcc gcg ctg gtg His Ala Ala Leu Val 10010	ctg gag gat Leu Glu Asp 67004
ggg ctg Gly Leu 10015	atg cag ctc aag acg Met Gln Leu Lys Thr 10020	cgc gag tgc gcc ggg Arg Glu Ser Ala Gly 10025	cgc gtg ctg Arg Val Leu 67049
gcc tcc Ala Ser 10030	aag gtc gag ggc acc Lys Val Glu Gly Thr 10035	ctg gtg ctg gac gaa Leu Val Leu Asp Glu 10040	ctg ctg cgc Leu Leu Arg 67094
gac gag Asp Glu 10045	cca ctc gac ttc ttc Pro Leu Asp Phe Phe 10050	gtc ctg tgc tcc tgc Val Leu Cys Ser Ser 10055	ctg agc gca Leu Ser Ala 67139
ttg ctc Leu Leu 10060	ggc gcg ctg ggg cag Gly Ala Leu Gly Gln 10065	gcg gac tat gcc gcc Ala Asp Tyr Ala Ala 10070	gcc agt gcc Ala Ser Ala 67184
ttc ctc Phe Leu 10075	gac gcg tat gcg cac Asp Ala Tyr Ala His 10080	tca cag cga ggg cgc Ser Gln Arg Gly Arg 10085	acg gac cgc Thr Asp Arg 67229
cgc acc Arg Thr 10090	atc tcc atg gac tgg Ile Ser Met Asp Trp 10095	gat cgc tgg ctg gag Asp Arg Trp Leu Glu 10100	gtg ggc gcc Val Gly Ala 67274
gcc atg Ala Met 10105	cgc ctg ggg ctg ggg Arg Leu Gly Leu Gly 10110	ctg gcg gcg gga gca Leu Ala Ala Gly Ala 10115	ctg ggg ctg Leu Gly Leu 67319
cag cgc Gln Arg 10120	acg gca ccc gga gag Thr Ala Pro Gly Glu 10125	tac acg gtg cga tgg Tyr Thr Val Arg Trp 10130	cag gcc gag Gln Ala Glu 67364
cgc tgc Arg Cys 10135	tgg tgg ctg gac gag Trp Trp Leu Asp Glu 10140	cac cgc ctg gaa gga His Arg Leu Glu Gly 10145	cgg gcc acg Arg Ala Thr 67409
ctg ccg Leu Pro 10150	ggg gtg gcg tac ctg Gly Val Ala Tyr Leu 10155	gag ctg gtg cga gcc Glu Leu Val Arg Ala 10160	gcc ctg gtc Ala Leu Val 67454
cag gaa Gln Glu 10165	ctg ggc gag gcc ccc Leu Gly Glu Ala Pro 10170	gtg gag ctg gag caa Val Glu Leu Glu Gln 10175	ctg gtg ctg Leu Val Leu 67499
ctc tct Leu Ser 10180	ctg ctg gaa gcg ccc Leu Leu Glu Ala Pro 10185	gcg ggg gag gag gtg Ala Gly Glu Glu Val 10190	gag gtg cga Glu Val Arg 67544
ttc cac	ctg cga ccg gag gat	gag ggc tat gcg ctg	gag atc cgc 67589

Phe His 10195	Leu Arg 10200	Pro Glu Asp 10205	Glu Gly Tyr Ala Leu 10205	Glu Ile Arg	
agc cgg Ser Arg 10210	gct ggc ggc ctc gcg Ala Gly Gly Leu Ala 10215	aat ggg ggc tgg cgc Asn Gly Gly Trp Arg 10220	agc cat gcg Ser His Ala	67634	
atg ggc Met Gly 10225	cgg gtg agg atg ctg Arg Val Arg Met Leu 10230	cct cgc ggg agc gct Pro Arg Gly Ser Ala 10235	cga ccc acc Arg Pro Thr	67679	
cac ccg His Pro 10240	cta cgg gag ctg gag Leu Arg Glu Leu Glu 10245	gaa cgg ctc ggc ttg Glu Arg Leu Gly Leu 10250	acc cag gcg Thr Gln Ala	67724	
ccg agg Pro Arg 10255	gag cat gag cca gct Glu His Glu Pro Ala 10260	cag ggc ccc cgc gag Gln Gly Pro Arg Glu 10265	ctg gca cct Leu Ala Pro	67769	
gcc ctg Ala Leu 10270	ggc cgg cgc tgg tcc Gly Arg Arg Trp Ser 10275	tcg ctg agc tgg cac Ser Leu Ser Trp His 10280	cgc gcg tgg Arg Ala Trp	67814	
aag gga Lys Gly 10285	gaa gag ggc ctg gcc Glu Glu Gly Leu Ala 10290	ttg atc gag ctc ccc Leu Ile Glu Leu Pro 10295	gag gag ctg Glu Glu Leu	67859	
gcc gag Ala Glu 10300	gat ctg cgg caa tgg Asp Leu Arg Gln Trp 10305	ccc ctg cac cct gcc Pro Leu His Pro Ala 10310	ctg ctg gac Leu Leu Asp	67904	
gcg gcg Ala Ala 10315	acc ggg ttt gca ccg Thr Gly Phe Ala Pro 10320	ctg ccc ccc ggt gcc Leu Pro Pro Gly Ala 10325	tgg ctg ccg Trp Leu Pro	67949	
ctg tcc Leu Ser 10330	tat ggc aac acc cgc Tyr Gly Asn Thr Arg 10335	atc cac ggc ccg ctg Ile His Gly Pro Leu 10340	ccg cgg cag Pro Arg Gln	67994	
ctg tac Leu Tyr 10345	agc cac atc cgc cgg Ser His Ile Arg Arg 10350	ctg gag ccc gcc agt Leu Glu Pro Ala Ser 10355	gcc cag gcc Ala Gln Ala	68039	
gga gtg Gly Val 10360	gtg cgg ctg gag gtg Val Arg Leu Glu Val 10365	cgc ctc atg gac ggc Arg Leu Met Asp Gly 10370	gaa ggg cgg Glu Gly Arg	68084	
gag ctg Glu Leu 10375	ctg tgc gtg gag gag Leu Cys Val Glu Glu 10380	ttc gtg ctc cgc cgg Phe Val Leu Arg Arg 10385	gtg gag gtg Val Glu Val	68129	
gac tcg Asp Ser 10390	ttg gct cgg cca cag Leu Ala Arg Pro Gln 10395	ccc gct ggc aag gct Pro Ala Gly Lys Ala 10400	ccg cgc cag Pro Arg Gln	68174	
gca gtg Ala Val 10405	ctt cca cga cca ggc Leu Pro Arg Pro Gly 10410	gcg ctc gac tcg ctg Ala Leu Asp Ser Leu 10415	cga ctg caa Arg Leu Gln	68219	
ccc ctg Pro Leu 10420	gag cgc ctt ccg ccg Glu Arg Leu Pro Pro 10425	cag gag gga gag gtg Gln Glu Gly Glu Val 10430	gag gtg cag Glu Val Gln	68264	

gtg ctc Val Leu 10435	gcc gcg ggc ctc aat Ala Ala Gly Leu Asn 10440	ttc aag gac gcg ctg Phe Lys Asp Ala Leu 10445	ctg gcg ctg Leu Ala Leu	68309
ggg gcg Gly Ala 10450	ttg cca gtg gag ctg Leu Pro Val Glu Leu 10455	gcc aac ggc gcc cca Ala Asn Gly Ala Pro 10460	ctg gcg ctg Leu Ala Leu	68354
gga gtc Gly Val 10465	gag tgc gcg ggc atc Glu Cys Ala Gly Ile 10470	atc tcc gcg gta ggt Ile Ser Ala Val Gly 10475	cca gga gtg Pro Gly Val	68399
aga ggc Arg Gly 10480	ctg cga gtg ggc gag Leu Arg Val Gly Glu 10485	gcg gtg gtg gcc gcg Ala Val Val Ala Ala 10490	gca gca gga Ala Ala Gly	68444
gcc ttc Ala Phe 10495	gcc tcg cat gtg cga Ala Ser His Val Arg 10500	gtc ccc cag gag cag Val Pro Gln Glu Gln 10505	gtc ttc ccc Val Phe Pro	68489
aag cca Lys Pro 10510	gcg ggc ctg agc ttc Ala Gly Leu Ser Phe 10515	gag cag gcg gcg atg Glu Gln Ala Ala Met 10520	gtg ccc gtc Val Pro Val	68534
act ctg Thr Leu 10525	ttc acc gcc tgg tat Phe Thr Ala Trp Tyr 10530	gcc ctg gag gag ctg Ala Leu Glu Glu Leu 10535	gcg cgg ctg Ala Arg Leu	68579
cgc gcg Arg Ala 10540	gga gag cac gtc ctc Gly Glu His Val Leu 10545	atc cac gcc gcg gcc Ile His Ala Ala Ala 10550	acg ggg gtg Thr Gly Val	68624
gga ctg Gly Leu 10555	gcg ggg gtg aag ttg Ala Gly Val Lys Leu 10560	gcg ctg cgg cgg ggc Ala Leu Arg Arg Gly 10565	gcc acg gtg Ala Thr Val	68669
tac gcc Tyr Ala 10570	acc gcg ggc agc gag Thr Ala Gly Ser Glu 10575	ccg aag cgc gag ctg Pro Lys Arg Glu Leu 10580	ctg cgc tcc Leu Arg Ser	68714
ctg ggg Leu Gly 10585	gta acg ctg gcc atg Val Thr Leu Ala Met 10590	gac tcg cgc gcg ccc Asp Ser Arg Ala Pro 10595	ggg ttt gac Gly Phe Asp	68759
gac cag Asp Gln 10600	ctt ctg caa cac acc Leu Leu Gln His Thr 10605	cag ggg cga ggc gtg Gln Gly Arg Gly Val 10610	gac gtg gtg Asp Val Val	68804
ctc aac Leu Asn 10615	tcg ctg agc ggc gag Ser Leu Ser Gly Glu 10620	ttc ctc tcc cgc agc Phe Leu Ser Arg Ser 10625	ctg ggc gtg Leu Gly Val	68849
ctc gct Leu Ala 10630	cgc cac ggg cgc ttc Arg His Gly Arg Phe 10635	gtc gag ctg ggt gta Val Glu Leu Gly Val 10640	agg gac atg Arg Asp Met	68894
ctc tct Leu Ser 10645	ggc ggc acg ctg ccg Gly Gly Thr Leu Pro 10650	ctg gct ccc ttc gag Leu Ala Pro Phe Glu 10655	cgc ggg ctc Arg Gly Leu	68939
acc ttc Thr Phe 10660	ctc gcg gcg cag ata Leu Ala Ala Gln Ile 10665	gac ccg ggg atg aag Asp Pro Gly Met Lys 10670	ggc tac cgg Gly Tyr Arg	68984

gag ctg Glu Leu 10675	atg ggc gag gcc ctg Met Gly Glu Ala Leu 10680	cgg cag atc gag cgc Arg Gln Ile Glu Arg 10685	gga gag ctg Gly Glu Leu	69029
gag ccg Glu Pro 10690	ctg ccc tac acg gca Leu Pro Tyr Thr Ala 10695	tgg cca ctg gag cgc Trp Pro Leu Glu Arg 10700	gtg gcc gag Val Ala Glu	69074
gcg ctc Ala Leu 10705	cag ctc gtc tcc aag Gln Leu Val Ser Lys 10710	ggc agg cac gta ggc Gly Arg His Val Gly 10715	aag gtg gtg Lys Val Val	69119
ctc acc Leu Thr 10720	ccg gaa gag ccc ttg Pro Glu Glu Pro Leu 10725	tca cgg ccg cca gcg Ser Arg Pro Pro Ala 10730	ctc ccg agc Leu Pro Ser	69164
tcc tca Ser Ser 10735	agg cca gtg caa ccc Arg Pro Val Gln Pro 10740	cgg gca ggc gtg gcg Arg Ala Gly Val Ala 10745	att gtc ggg Ile Val Gly	69209
ctg cgc Leu Arg 10750	tcc gcc gag ggc tgc Ser Ala Glu Gly Cys 10755	gag gcc ttc gag cgc Glu Ala Phe Glu Arg 10760	atc ctc gcg Ile Leu Ala	69254
gcc ggc Ala Gly 10765	ctg ccg cag gtg gcc Leu Pro Gln Val Ala 10770	gtc tcc acc cgt gag Val Ser Thr Arg Glu 10775	ctg cgc gcg Leu Arg Ala	69299
cgc atg Arg Met 10780	gcg gag atc gag cgc Ala Glu Ile Glu Arg 10785	ctg cgc gtc tcc tcc Leu Arg Val Ser Ser 10790	tgg gag ccg Trp Glu Pro	69344
gcg ctt Ala Leu 10795	ccc tcg gtg ccc cgc Pro Ser Val Pro Arg 10800	ggc tcc ccc gcc agg Gly Ser Pro Ala Arg 10805	acc gaa cgc Thr Glu Arg	69389
tcc aag Ser Lys 10810	ccc tat gtt gct cct Pro Tyr Val Ala Pro 10815	cgc acc gag cgc gag Arg Thr Glu Arg Glu 10820	cgc gcc ctg Arg Ala Leu	69434
gcc gcg Ala Ala 10825	ctc tgg cag gac ctg Leu Trp Gln Asp Leu 10830	ctc ggc gtc tcc gag Leu Gly Val Ser Glu 10835	gtg ggg ttg Val Gly Leu	69479
gat gat Asp Asp 10840	gac ttc ttc gag ctg Asp Phe Phe Glu Leu 10845	aaa ggg gac tcg ctg Lys Gly Asp Ser Leu 10850	ctc gcc atc Leu Ala Ile	69524
cag ctc Gln Leu 10855	atg ggg ccg ttg cgc Met Gly Arg Leu Arg 10860	aag gag ctg gag gtg Lys Glu Leu Glu Val 10865	gaa ttg cca Glu Leu Pro	69569
ctc tcc Leu Ser 10870	tcc ttc ctc gcc cgc Ser Phe Leu Ala Arg 10875	cct acg ctg cgc aca Pro Thr Leu Arg Thr 10880	ctg ctc tcc Leu Leu Ser	69614
gcc atg Ala Met 10885	cca gcc ccg gca acg Pro Ala Pro Ala Thr 10890	gac gag cct gcc tcg Asp Glu Pro Ala Ser 10895	gcc acc ggg Ala Thr Gly	69659
gca atc Ala Ala 10895	cca gcc gcc gct ccc Pro Ala Ala Ala Pro 10900	cag ccg tca ccg gct Gln Pro Ser Pro Ala 10905	gtc tcc agc Val Ser Ser	69704

10900		10905		10910	
gaa ccc Glu Pro 10915	gct cgg aag tgg cgc Ala Arg Lys Trp Arg 10920	cac ctg gtg ccc atc His Leu Val Pro Ile 10925	caa cct cag Gln Pro Gln	69749	
ggc gag Gly Glu 10930	agc cct ccc ttc ttc Ser Pro Pro Phe Phe 10935	tgg gct gcg ccg ctg Trp Ala Ala Pro Leu 10940	atg ggc acc Met Gly Thr	69794	
gtg ttt Val Phe 10945	ccc tac ttc acg ctg Pro Tyr Phe Thr Leu 10950	gcc cgc tgc ctg gcg Ala Arg Cys Leu Ala 10955	ccc acc cac Pro Thr His	69839	
ccc ttc Pro Phe 10960	tat gct ctc cag ccg Tyr Ala Leu Gln Pro 10965	cca ggg ttg cag gag Pro Gly Leu Gln Glu 10970	ggg cag gag Gly Gln Glu	69884	
ccc atg Pro Met 10975	gac aag gtg gag gaa Asp Lys Val Glu Glu 10980	ctg gcg gcc ctg tac Leu Ala Ala Leu Tyr 10985	gtg cgc gag Val Arg Glu	69929	
ctg aga Leu Arg 10990	gag ctg cag ccg cga Glu Leu Gln Pro Arg 10995	ggg ccc tac cgc ctg Gly Pro Tyr Arg Leu 11000	gga ggc tgg Gly Gly Trp	69974	
tcc ttc Ser Phe 11005	ggc tgc gtg gtg gct Gly Cys Val Val Ala 11010	tat gag gtt gcc cta Tyr Glu Val Ala Leu 11015	cag ctc gag Gln Leu Glu	70019	
gcg gct Ala Ala 11020	gga gag cag gtg gcg Gly Glu Gln Val Ala 11025	ctg ctg agc ctg ctg Leu Leu Ser Leu Leu 11030	gac ttc cct Asp Phe Pro	70064	
gcc cct Ala Pro 11035	tcg ggc cag cga gcc Ser Gly Gln Arg Ala 11040	agt ctc tgg gcg acg Ser Leu Trp Ala Thr 11045	gcc cgc ttc Ala Arg Phe	70109	
ttc agc Phe Ser 11050	ggc tcg gtg ctg cgc Gly Ser Val Leu Arg 11055	ggc ctg gcg ccc tat Gly Leu Ala Pro Tyr 11060	acg ctc gac Thr Leu Asp	70154	
tat ctc Tyr Leu 11065	tac ctg gcg gct cgc Tyr Leu Ala Ala Arg 11070	gct cct ctg aat cca Ala Pro Leu Asn Pro 11075	gac gct gcc Asp Ala Ala	70199	
tcg cgc Ser Arg 11080	ctg agc agc tcc ctg Leu Ser Ser Ser Leu 11085	acc cga gga tgg gag Thr Arg Gly Trp Glu 11090	cgc ctg cgg Arg Leu Arg	70244	
aaa gga Lys Gly 11095	ggg ctg gtg cag gaa Gly Leu Val Gln Glu 11100	ctg ctg gac cat gcc Leu Leu Asp His Ala 11105	gcc atg gcc Ala Met Ala	70289	
cgg gtg Arg Val 11110	gtg cct gag gac tca Val Pro Glu Asp Ser 11115	cgg ctg ctg ctg ctg Arg Leu Leu Leu Leu 11120	cga gag cct Arg Glu Pro	70334	
ggc att Gly Ile 11125	gcc ccc atg ttg agg Ala Pro Met Leu Arg 11130	ctg acc cgg gct cac Leu Thr Arg Ala His 11135	cag cga gcc Gln Arg Ala	70379	
atg ctc	tcc tat cgg ccc cga	ggt cgc ctc cgc cag	cgc atc gtc	70424	

Met Leu	Ser Tyr Arg Pro Arg	Gly Arg Leu Arg Gln	Arg Ile Val
11140	11145	11150	
ctc ttc	cgc acc tcc gag cag	gcc tgg agc ttc gcg	cga gac ctg 70469
Leu Phe	Arg Thr Ser Glu Gln	Ala Trp Ser Phe Ala	Arg Asp Leu
11155	11160	11165	
ggc tgg	gga gcc ctc agc gcc	tgc ggc gtg gat gtg	cgc gag gcg 70514
Gly Trp	Gly Ala Leu Ser Ala	Ser Gly Val Asp Val	Arg Glu Ala
11170	11175	11180	
ccg gga	gac cat atg acg ctg	ctg cgg cca cct cac	gtg gag cgg 70559
Pro Gly	Asp His Met Thr Leu	Leu Arg Pro Pro His	Val Glu Arg
11185	11190	11195	
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Val Ala	Glu Gln Leu Arg Ala	Leu Leu Ser Ser Ala	Pro Leu Pro
11200	11205	11210	
act cgc	cgc tga gttcgggctg	cgcgccagag gctgcctcat	gcatgccctt 70656
Thr Arg	Arg		
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11220

11225	caa gcg	ccc gag acc tgg acg	gag cac tgg ttc gag	cac aac cag	75598
	Gln Ala	Pro Glu Thr Trp Thr	Glu His Trp Phe Glu	His Asn Gln	
11240		11245	11250		
acc gtc	tcc cgc gtc tac cag	gac aat gac gtg gcc	gtg tac ttc	75643	
Thr Val	Ser Arg Val Tyr Gln	Asp Asn Asp Val Ala	Val Tyr Phe		
11255		11260	11265		
gac tcg	gcc gtg aac cgg tcc	atc acc tgg ccc aac	acc tac ctg	75688	
Asp Ser	Ala Val Asn Arg Ser	Ile Thr Trp Pro Asn	Thr Tyr Leu		
11270		11275	11280		
ggc gac	gtg tgg cga tac acc	aag agg acc tac gga	cac ttc ggc	75733	
Gly Asp	Val Trp Arg Tyr Thr	Lys Arg Thr Tyr Gly	His Phe Gly		
11285		11290	11295		
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Thr Asp	Ser Gln Leu Tyr Thr	Ile Phe His Ala Gly	Lys Tyr Ser		
11300		11305	11310		
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Gly Gly	His Pro Ser Thr Tyr	Phe Asp Ala Ser His	Asp Arg Arg		
11315		11320	11325		
aac gtg	att gat gtg ggt tcc	agt tcc ccc acg gcc	tgg act gcc	75868	
Asn Val	Ile Asp Val Gly Ser	Ser Ser Pro Thr Ala	Trp Thr Ala		
11330		11335	11340		
ggc acc	ggc aac gac ctg gac	atc gtc acc cat gag	gtg gcc cac	75913	
Gly Thr	Gly Asn Asp Leu Asp	Ile Val Thr His Glu	Val Ala His		
11345		11350	11355		
atc gtg	gaa ctc gcc agc aag	ggc gtg cac gac tcg	cct gcc ttc	75958	
Ile Val	Glu Leu Ala Ser Lys	Gly Val His Asp Ser	Pro Ala Phe		
11360		11365	11370		
ggc ctg	tgg cgc gac agc aag	tgg gcg gag atc ttc	aac tac gac	76003	
Gly Leu	Trp Arg Asp Ser Lys	Trp Ala Glu Ile Phe	Asn Tyr Asp		
11375		11380	11385		
gtc tac	ctg gcg ttg ggt cgc	acc agt gat gcc aat	cgc tgg tac	76048	
Val Tyr	Leu Ala Leu Gly Arg	Thr Ser Asp Ala Asn	Arg Trp Tyr		
11390		11395	11400		
aac ctg	atg gtc aac acg acg	gac agc ttc ccc cgc	gcc aac acc	76093	
Asn Leu	Met Val Asn Thr Thr	Asp Ser Phe Pro Arg	Ala Asn Thr		
11405		11410	11415		
cac tgg	ttc cgg gat tgg ttc	tat ccc atc tac aag	aac cac ggc	76138	
His Trp	Phe Arg Asp Trp Phe	Tyr Pro Ile Tyr Lys	Asn His Gly		
11420		11425	11430		
ggc tcc	tcg gtg ctc aac cgg	tac ttc gtc ctg ctc	gcg cag tac	76183	
Gly Ser	Ser Val Leu Asn Arg	Tyr Phe Val Leu Leu	Ala Gln Tyr		
11435		11440	11445		
ctg ccg	aag aac ggc agc aac	tac gcg cga agc ctg	aac tgg gga	76228	
Leu Pro	Lys Asn Gly Ser Asn	Tyr Ala Arg Ser Leu	Asn Trp Gly		
11450		11455	11460		
gag ttc	atc cac ttc tgg agt	ggc gcc gcg ggc gtc	aat ctc aag	76273	

Glu Phe 11465	Ile His Phe Trp Ser 11470	Gly Ala Ala Gly Val 11475	Asn Leu Lys
acc ctg Thr Leu 11480	gcc acg tcc gca ttc Ala Thr Ser Ala Phe 11485	gga tgg ccc gcc gag Gly Trp Pro Ala Glu 11490	tgg gaa gcg Trp Glu Ala 76318
cag ttc Gln Phe 11495	acc cag gct cag cgt Thr Gln Ala Gln Arg 11500	gac ttc ccc ttc acc Asp Phe Pro Phe Thr 11505	tac acc ccc Tyr Thr Pro 76363
ccg gcc Pro Gly 11510	ccc acg gct gtc acc Pro Thr Ala Val Thr 11515	gtg ttc cag gac cag Val Phe Gln Asp Gln 11520	aac tac ggt Asn Tyr Gly 76408
ggc tat Gly Tyr 11525	gga atg gca ctg ccc Gly Met Ala Leu Pro 11530	gtt ggc cgt tac acc Val Gly Arg Tyr Thr 11535	ctg tcc gcc Leu Ser Ala 76453
ctg cat Leu His 11540	gcc tgg ggc gtg cgc Ala Trp Gly Val Arg 11545	aat gac gac atc acc Asn Asp Asp Ile Thr 11550	tcc ctg aag Ser Leu Lys 76498
gtc gcc Val Ala 11555	agc ggc tac aag gtc Ser Gly Tyr Lys Val 11560	acc ctg tat gaa cat Thr Leu Tyr Glu His 11565	gac aac ttc Asp Asn Phe 76543
agc ggt Ser Gly 11570	gcc agc ctc acc aag Ala Ser Leu Thr Lys 11575	acg gcg gac gat gcc Thr Ala Asp Asp Ala 11580	tcg ctc gtc Ser Leu Val 76588
gac gac Asp Asp 11585	agc tgg aac gac aaa Ser Trp Asn Asp Lys 11590	atg tcc tcg ctc atc Met Ser Ser Leu Ile 11595	gtg agc gcg Val Ser Ala 76633
tcg ggg Ser Gly 11600	atg tag gtcagcgccg Met	ctcgggctcc ggggcgtgcc gggcttcctt	76685
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			11605
act cgc tac ctg gag Thr Arg Tyr Leu Glu 11610	cgt atc ggt gtc tcg Arg Ile Gly Val Ser 11615	gcg ggt acg ccg ctc Ala Gly Thr Pro Leu 11620	76843
gcc gcg ctc cat cgg Ala Ala Leu His Arg 11625	gcc cac ctc gag gcc Ala His Leu Glu Ala 11630	gtg ccg ttc gag aac Val Pro Phe Glu Asn 11635	76888
ctc gac atc cac ctg Leu Asp Ile His Leu 11640	aag cgg ccc atc cgg Lys Arg Pro Ile Arg 11645	ctc gat gag gcg gcc Leu Asp Glu Ala Ala 11650	76933
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gag gtc aat ggc ctc Glu Met Asn Gly Leu 11670	ttc gcc cgc ctg ctc Phe Ala Arg Leu Leu 11675	cgg act ctc ggt tac Arg Thr Leu Gly Tyr 11680	77023

11670					11675					11680					
cgg	gtg	acg	ctg	ctg	tcg	gcg	cgc	gtg	gcc	tcg	cgt	ccc	gat	ggc	77068
Arg	Val	Thr	Leu	Leu	Ser	Ala	Arg	Val	Ala	Ser	Arg	Pro	Asp	Gly	
11685					11690					11695					
agc	gcc	tac	ggt	ccc	gac	ttc	gac	cat	ctg	gcg	ctc	ctg	gtg	gag	77113
Ser	Ala	Tyr	Gly	Pro	Asp	Phe	Asp	His	Leu	Ala	Leu	Leu	Val	Glu	
11700					11705					11710					
gac	gcc	tcg	ggc	cgc	tgg	ctg	gcc	gac	gtg	ggc	ttc	ggc	gag	tgc	77158
Asp	Ala	Ser	Gly	Arg	Trp	Leu	Ala	Asp	Val	Gly	Phe	Gly	Glu	Cys	
11715					11720					11725					
ttc	ctg	gag	ccg	ctg	cgc	ctc	gac	gag	cgc	ggc	gtg	cag	acc	cag	77203
Phe	Leu	Glu	Pro	Leu	Arg	Leu	Asp	Glu	Arg	Gly	Val	Gln	Thr	Gln	
11730					11735					11740					
gac	gga	cgc	ggc	cac	cgg	ctg	gtc	gag	gac	gcg	gag	ggg	ctc	gtc	77248
Asp	Gly	Arg	Gly	His	Arg	Leu	Val	Glu	Asp	Ala	Glu	Gly	Leu	Val	
11745					11750					11755					
gtc	tgg	cgc	gag	gcg	gcg	tcg	ggg	gac	tgg	aag	gcc	cag	tac	gtc	77293
Val	Trp	Arg	Glu	Ala	Ala	Ser	Gly	Asp	Trp	Lys	Ala	Gln	Tyr	Val	
11760					11765					11770					
gtc	tcg	ctc	atc	ccg	cgc	gag	ctc	ggg	gac	ttc	gcg	gcc	atg	tgc	77338
Val	Ser	Leu	Ile	Pro	Arg	Glu	Leu	Gly	Asp	Phe	Ala	Ala	Met	Cys	
11775					11780					11785					
cac	cac	cag	cag	acc	tcg	ccg	gag	tcc	cac	ttc	acg	cag	cga	cgc	77383
His	His	Gln	Gln	Thr	Ser	Pro	Glu	Ser	His	Phe	Thr	Gln	Arg	Arg	
11790					11795					11800					
ctc	tgc	acc	cgg	acc	acg	ccg	gac	ggg	cgc	atc	acc	ctc	aag	gag	77428
Leu	Cys	Thr	Arg	Thr	Thr	Pro	Asp	Gly	Arg	Ile	Thr	Leu	Lys	Glu	
11805					11810					11815					
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Gly	Ala	Leu	Val	Val	Thr	Ser	Gly	Gly	Ala	Arg	His	Glu	Gln	Arg	
11820					11825					11830					
ctc	ccg	gac	gag	gcc	gcg	tgg	cgg	gcc	gcg	ctc	acg	cgg	cac	ttc	77518
Leu	Pro	Asp	Glu	Ala	Ala	Trp	Arg	Ala	Ala	Leu	Thr	Arg	His	Phe	
11835					11840					11845					
ggc	atc	acc	ctg	ccc	tcc	ggc	gga	tga	cgccgctccg	gacgcacatg				77565	
Gly	Ile	Thr	Leu	Pro	Ser	Gly	Gly								
11850															
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Met Thr Thr Ser Lys Val Arg Ser Gly															
					11855					11860					
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Ala	Thr	Leu	Gly	Gly	Val	Thr	Ala	Arg	Phe	Ser	Thr	Gly	Glu	Gln	
11865					11870					11875					

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gag ccg aag Glu Pro Lys 11940	ccg aca ccg aag ccg Pro Thr Pro Lys Pro 11945	ccg acc aac aaa aac Pro Thr Asn Lys Asn 11950	acc agc Thr Ser 78065
gtg ctc ccc Val Leu Pro 11955	aag ggc atc ccg aac Lys Gly Ile Pro Asn 11960	acc gag ggc atg tct Thr Glu Gly Met Ser 11965	cag gcg Gln Ala 78110
aag gag tac Lys Glu Tyr 11970	gcg ctc tac tcg aag Ala Leu Tyr Ser Lys 11975	tac gtg gag aag tac Tyr Val Glu Lys Tyr 11980	ggc gac Gly Asp 78155
gcc aag gcg Ala Lys Ala 11985	aag cag gac ctc gcg Lys Gln Asp Leu Ala 11990	gcc ggc aag cgc gtc Ala Gly Lys Arg Val 11995	atc gtc Ile Val 78200
ggc ctg agg Gly Leu Arg 12000	gtg aac acg ccc ttc Val Asn Thr Pro Phe 12005	acc cgt gat cgc ccc Thr Arg Asp Arg Pro 12010	tcc ggc Ser Gly 78245
ggc tcc tac Gly Ser Tyr 12015	gac gat cgg ctc gtc Asp Asp Arg Leu Val 12020	gtc atg tgg aag gac Val Met Trp Lys Asp 12025	agc agc Ser Ser 78290
ggc aag ccg Gly Lys Pro 12030	cac gtc cag gag ttc His Val Gln Glu Phe 12035	aag gcc aac acc gag Lys Ala Asn Thr Glu 12040	ccc aac Pro Asn 78335
cgc cgc tgg Arg Arg Trp 12045	gcc gat gac ccg agc Ala Asp Asp Pro Ser 12050	cag agc acc aag ccg Gln Ser Thr Lys Pro 12055	gtc ggc Val Gly 78380
cgc ctc gtc Arg Leu Val 12060	ggc aac aag acc tac Gly Asn Lys Thr Tyr 12065	cac tac cgg aag agc His Tyr Arg Lys Ser 12070	ttc aac Phe Asn 78425
ggc aac ttc Gly Asn Phe 12075	ggt ggc aac atc ctc Gly Gly Asn Ile Leu 12080	gcg ccg gac ctg cgc Ala Pro Asp Leu Arg 12085	tac ggg Tyr Gly 78470
aac ccg acc Asn Pro Thr 12090	gtg cgg cgc gac acc Val Arg Arg Asp Thr 12095	aac cgc gat cac cgg Asn Arg Asp His Arg 12100	atc aac Ile Asn 78515
tcg aag gac Ser Lys Asp	gat gtg ttc agc ggc Asp Val Phe Ser Gly	gac tgg ggc ggc cag Asp Trp Gly Gly Gln	ggc tac Gly Tyr 78560

12105	12110	12115	
tac ttc cat cgc ggc gga acg acc	gac acg tac tcc gcc	ggc tgc	78605
Tyr Phe His Arg Gly Gly Thr Thr	Asp Thr Tyr Ser Ala	Gly Cys	
12120	12125	12130	
cag acg atg gac cag ggc cgc ttc	aac aac ttc tgg gcc	gcg ctc	78650
Gln Thr Met Asp Gln Gly Arg Phe	Asn Asn Phe Trp Ala	Ala Leu	
12135	12140	12145	
ggc tct cag agc gag ttc agc tac	gtc ctg gcc cag gtc	ggc tga	78695
Gly Ser Gln Ser Glu Phe Ser Tyr	Val Leu Ala Gln Val	Gly	
12150	12155	12160	
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cgtaagacct cgccgtgccc cgtcgtaacg	ggctccagcc ttcgtgagac	ttcccttggc	78815
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ctgccgcacc tgtcaggtag tc atg acg cgc gtc	gag cag ctg cga gac		79164
	Met Thr Arg Val Glu Gln Leu Arg Asp		
	12165	12170	
ttg gag acg gcc aag cag ggg gcg gcg ctg	ctg gag gcg gaa aac		79209
Leu Glu Thr Ala Lys Gln Gly Ala Ala Leu	Leu Glu Ala Glu Asn		
12175	12180	12185	
gcc cgg ctg cac cag cgc ctt gag gcg ctc	gtc gcg gag aat gcc		79254
Ala Arg Leu His Gln Arg Leu Glu Ala Leu	Val Ala Glu Asn Ala		
12190	12195	12200	
cgg ctc aag ggc gag gac gcc cag gcg cac	ctg cac cac gcg gat		79299
Arg Leu Lys Gly Glu Asp Ala Gln Ala His	Leu His His Ala Asp		
12205	12210	12215	
gag acg cat tgg ctg ctg ctg gac aag ggg	ccg ggc acc aag tgg		79344
Glu Thr His Trp Leu Leu Leu Asp Lys Gly	Pro Gly Thr Lys Trp		
12220	12225	12230	
tac gcg tgg acg gtg gcc tcg ccc gac acc	gtc ttc cat cgc atc		79389
Tyr Ala Trp Thr Val Ala Ser Pro Asp Thr	Val Phe His Arg Ile		
12235	12240	12245	
tac ccc agc cgc tcc ggg gcg acg gcg cgc	acc gtg ctg ggc gac		79434
Tyr Pro Ser Arg Ser Gly Ala Thr Ala Arg	Thr Val Leu Gly Asp		
12250	12255	12260	
tac gag ggc gtc gtg ctg gtg gat ggg tat	gcg gcg tac cag acg		79479
Tyr Glu Gly Val Val Leu Val Asp Gly Tyr	Ala Ala Tyr Gln Thr		
12265	12270	12275	
gcg acg aag tcc agc gcg gac ggg ccc tgt	cca gcc acc ctg gcc		79524
Ala Thr Lys Ser Ser Ala Asp Gly Pro Cys	Pro Ala Thr Leu Ala		
12280	12285	12290	

ttc tgc tgg gcc cac	gtg agg aga aaa ttc	ttc gaa gcc cag cag	79569
Phe Cys Trp Ala His	Val Arg Arg Lys Phe	Phe Glu Ala Gln Gln	
12295	12300	12305	
ttt gcc cct gcc tgc	aaa gag gtg ctg gac	ctc atc ggc gag ctg	79614
Phe Ala Pro Ala Cys	Lys Glu Val Leu Asp	Leu Ile Gly Glu Leu	
12310	12315	12320	
tac gcc gtc gag gcg	gac ctg ccg ggc tgg	tac gcg ctg gag ggc	79659
Tyr Ala Val Glu Ala	Asp Leu Pro Gly Trp	Tyr Ala Leu Glu Gly	
12325	12330	12335	
gag gag cgt cag gcc	gcg ctc gcg cac cgg	ctc gcc gtg cgt cag	79704
Glu Glu Arg Gln Ala	Ala Leu Ala His Arg	Leu Ala Val Arg Gln	
12340	12345	12350	
cag aag tcc gcg ccg	ctg acc gag cgc atc	cgc gac tgg gcg cac	79749
Gln Lys Ser Ala Pro	Leu Thr Glu Arg Ile	Arg Asp Trp Ala His	
12355	12360	12365	
gcg cag cgc gca ctg	ccc ggc agt gcc ttt	cgc aag gcc ctc gag	79794
Ala Gln Arg Ala Leu	Pro Gly Ser Ala Phe	Arg Lys Ala Leu Glu	
12370	12375	12380	
tac atg ctc aac ctc	tgg gcg ggg ctg acg	gtc ttc ctc acc cag	79839
Tyr Met Leu Asn Leu	Trp Ala Gly Leu Thr	Val Phe Leu Thr Gln	
12385	12390	12395	
ccg cag gtg ccg ctg	gac aat aac cac gtc	gag cgc cag ctg cgt	79884
Pro Gln Val Pro Leu	Asp Asn Asn His Val	Glu Arg Gln Leu Arg	
12400	12405	12410	
gac atg gtg ata ggc	agg aag aac ctc aag	aca gcg cgg ctg cga	79929
Asp Met Val Ile Gly	Arg Lys Asn Leu Lys	Thr Ala Arg Leu Arg	
12415	12420	12425	
gga gag gcc ccg ggc	cac tac ctg cgg cgc	cct gcg ctc gcc gcc	79974
Gly Glu Ala Pro Gly	His Tyr Leu Arg Arg	Pro Ala Leu Ala Ala	
12430	12435	12440	
atc gag aat ccg ggc	acc gtg acg ctg ccg	aag gcc cag agc tga	80019
Ile Glu Asn Pro Gly	Thr Val Thr Leu Pro	Lys Ala Gln Ser	
12445	12450		
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<210> 2

<211> 481

<212> PRT

<213> Angiococcus disciformis

<400> 2

Val Thr Arg Pro Tyr Pro Ser Ser Leu Pro Arg Leu Gly Gly Lys Pro
 1 5 10 15

Ser Ser Gln Met Ala Arg Ile Leu Leu Val Asp Asp Glu Lys Ile Ala
 20 25 30

Arg Thr Leu Tyr Gly Asp Tyr Leu Thr Ala Val Gly His Ala Val Thr
 35 40 45

Ala Val Gly Ser Leu Gln Asp Ala Arg Glu Ala Leu Ala Gly Asp Arg
 50 55 60

Phe Asp Ala Val Val Thr Asp Leu Ile Leu Pro Gly Gly Asp Gly Met
 65 70 75 80

Glu Val Leu Arg His Val Arg Glu Arg His Pro Gly Val Glu Val Val
 85 90 95

Val Ile Thr Gly Leu Glu Lys Val Asp Pro Ala Val Arg Ala Ile Lys
 100 105 110

Ser Gly Ala Ala Glu Tyr Leu Val Lys Pro Val Ala Pro Glu Ala Leu
 115 120 125

Gln His Ala Val Arg Arg Ala Leu Thr Thr Arg Asp Leu Leu Gln Glu
 130 135 140

Asn Ala Ser Leu Arg Arg His Val Ala Met Leu Glu Ala Gly Gln Arg
145 150 155 160

Ile Ala Thr Thr Leu Glu Arg Glu Lys Leu Ala Ser Ala Thr Thr Ser
165 170 175

Ala Leu Glu Ser Met Ala Cys Ala Ser Ala Val Val Leu Leu Glu Arg
180 185 190

Asp Gly Asp Lys Gly Leu Arg Leu Gln Gly Val Arg Gly Leu Pro Pro
195 200 205

Arg His Glu Pro Glu Leu Val Ala Thr Leu Val Glu Arg Leu Ser Asn
210 215 220

Ala Arg Ala Pro Arg Glu Leu Glu Gly Leu Asp Ala Ala Phe Pro Arg
225 230 235 240

Val Leu Ser Ile Pro Ala Val Glu Gly Thr Thr Val Leu Gly His Ala
245 250 255

Val Leu Phe Phe Asp Gly Ala Glu Pro Glu Trp Thr Gly Glu Thr Ala
260 265 270

Gly Tyr Leu Val Arg Asn Trp Ala Leu Ala Leu Arg Asn Leu Gly Arg
275 280 285

Phe Ala Ala Val Glu Asp Leu Ala Tyr Val Asp Asp Leu Thr Arg Leu
290 295 300

Phe Asn Thr Arg Tyr Leu His Leu Val Leu Asp Arg Glu Val Gln Asp
305 310 315 320

Ser Val Gln Thr Gln Arg Pro Phe Ser Leu Leu Phe Leu Asp Leu Asp
325 330 335

His Phe Lys Ser Ile Asn Asp Thr His Gly His Leu Val Gly Ser Arg
340 345 350

Leu Leu Val Glu Thr Ala Arg Val Val Lys Gly Cys Val Arg Asp His
355 360 365

Asp Val Val Ala Arg Tyr Gly Gly Asp Glu Tyr Val Val Leu Leu Arg
370 375 380

Asn Thr Asp Ser Gly Gly Ala Leu Lys Val Ala Glu Arg Ile Arg Arg
385 390 395 400

Thr Met Glu Thr His Leu Phe Leu Ala Arg Glu Gly Leu Ser Leu Lys
 405 410 415

Leu Ser Thr Cys Ile Gly Val Ala Ser Phe Pro Glu His Ala Arg Asp
 420 425 430

Lys Ala Thr Leu Leu Asp Leu Ala Asp Arg Ala Met Tyr Arg Gly Lys
 435 440 445

Arg Gly Ser Arg Asn Val Val Tyr Met Ala Ala Leu Asp Leu Glu Pro
 450 455 460

Leu Pro Ala Glu Arg Arg Gln Gly Gly Ser Gly Pro Gly Gly Ser Ser
 465 470 475 480

Thr

<210> 3

<211> 346

<212> PRT

<213> Angiococcus disciformis

<400> 3

Val Gly Gly Val Glu Ala Arg Leu Asp Ala Val Ala Asp Ala Phe Glu
 1 5 10 15

Ala Gly Asp Phe Glu Ala Ala Leu Ala Gly Ala Glu Gly Leu Leu Ala
 20 25 30

Asp Ala Pro Glu Leu Pro Glu Ala Leu His Phe Arg Ala Ser Ala Leu
 35 40 45

Val Glu Leu Gly Arg Leu Glu Glu Ala Gly Lys Ala Phe Gly Gln Ala
 50 55 60

Leu Lys Val Ala Pro Glu Asp Leu Glu Ile Leu Leu Ser Ala Ala Asp
 65 70 75 80

Cys Leu Val Cys Arg Ala Gly Glu Asp Arg Glu Ala Val Ala Glu Gly
 85 90 95

Leu Ala Leu Cys Ala Arg Gly Arg Arg Leu Ala Gln Lys Ala Asp Asp

100

105

110

Val Glu Met Leu Tyr Glu Phe Leu Leu Leu Glu Gly Met Gly Leu Asn
115 120 125

Gln Met Gly Glu Cys Ala Thr Ala Leu Val Ser Leu Asp Ala Ala Leu
130 135 140

Gly His Met Pro Arg Ser Leu Asp Ala Gln Val Glu Arg Gly Ile Ala
145 150 155 160

Leu Phe Glu Leu Cys Arg Phe Asp Glu Ala Lys Ala Ala Phe Glu Lys
165 170 175

Val Leu Lys Asp Ala Pro Asp Asp Pro Trp Ala His His Tyr Leu Gly
180 185 190

Leu Ile Ala Glu Arg Arg Gly Asp Glu Lys Glu Ala Lys Arg Arg Phe
195 200 205

Asp Lys Ala Arg Ala Leu Val Pro Glu Glu Phe Pro Pro Pro Val Glu
210 215 220

Leu Ala Glu Ala Glu Phe Asp Arg Ala Val Glu Asp Ala Val Lys Ser
225 230 235 240

Leu Pro Arg His Ala Lys Gln Tyr Leu Asp Asn Val Thr Ile Ala Val
245 250 255

Glu Asp Leu Pro Ser Asp Glu Asp Leu Leu Gly Gln Asp Pro Pro Leu
260 265 270

Ser Pro Ser Ile Leu Gly Val Phe Arg Gly Thr Pro Val Gly Glu Arg
275 280 285

Ser Val Met Asn Ala Tyr Glu Leu Pro Ala Ser Ile Val Leu Tyr Gln
290 295 300

Arg Asn Leu Glu Arg Phe Ala Arg Thr Arg Glu Glu Leu Ile Glu Gln
305 310 315 320

Ile Gly Ile Thr Val Met His Glu Val Gly His Leu Met Gly Leu Asp
325 330 335

Glu Asp Asp Leu Trp Gln Arg Gly Leu Asp
340 345

<210> 4

<211> 214

<212> PRT

<213> Angiococcus disciformis

<400> 4

Met Gly Ile Ser Glu Arg Lys Glu Arg Gln Arg Ala Glu Leu Arg Glu
1 5 10 15

Gln Ile Leu Gln Val Ala Lys Asp Met Val Thr Arg Glu Gly Phe Gly
20 25 30

Ala Leu Ser Met Arg Lys Leu Ala Asp Ala Val Glu Tyr Ala Pro Ala
35 40 45

Thr Leu Tyr Leu His Phe Glu Asn Arg Asp Ala Ile Ala Arg Glu Leu
50 55 60

Cys Ile Arg Gly Phe Gln Asp Leu Leu Glu Ala Phe Glu Pro Ala Ala
65 70 75 80

Ser Val Glu Glu Pro Val Glu Arg Leu Tyr Arg Leu Gly Glu Ala Tyr
85 90 95

Val Lys Phe Gly Leu Glu Gln Pro Glu Thr Tyr Arg Leu Ile Phe Met
100 105 110

Glu Asp Pro Lys Leu Ser Thr Ala Leu Phe Arg Asp Ala Pro Glu Asp
115 120 125

Gly Ala Gly Pro Arg Ser Phe Gly Val Leu Val Lys Val Phe Glu Asp
130 135 140

Leu Lys Ala Ala Gly Arg Ile Ala Glu Asp Ala Glu Pro Ser Lys Leu
145 150 155 160

Ala Glu Val Leu Trp Ala Gly Val His Gly Ile Val Ala Leu Arg Leu
165 170 175

Thr Cys Thr Gly Phe Lys Gly Ser Pro Pro Glu Glu Leu Ala Arg Leu
180 185 190

Leu Val Ser Thr Met Val Asn Gly Leu Pro Gly Leu Lys Pro Val Lys
195 200 205

Ala Ala Arg Lys Thr Arg
210

<210> 5

<211> 378

<212> PRT

<213> *Angiococcus disciformis*

<400> 5

Met Thr Lys Trp Ser Gly Lys Trp Ile Gly Gly Arg Thr Tyr Thr Ala
1 5 10 15

Thr Asp Gly Ser Thr Arg Trp Ile Ile Arg Lys Thr Val Ala Gly Val
20 25 30

Ala Tyr Asn Val Thr Leu Asp Val Arg Ser Glu Ala Glu Ala Leu Ala
35 40 45

Glu Leu Ala Ala Phe Arg Arg Asn Pro Ala Ala Tyr Arg Thr Ala Ser
50 55 60

Gln Glu Arg Gln Asp Glu Ala Gln Gln Ala Gln Glu Asp Ala Ala Gln
65 70 75 80

Ala Val Phe Leu Asp Glu Asp Arg Ala Arg Arg Phe Leu Gln His Leu
85 90 95

Lys Ser Ser Gly Arg Ser Asp Glu Tyr Leu Lys Ser Thr Arg Ser Tyr
100 105 110

Leu Ala Ala Trp Ala Thr Ala Leu Ala Asp Lys Asp Leu Arg Ala Val
115 120 125

Thr Gly Pro Ala Leu Lys Lys Ile Leu Ala Thr Trp Asp Thr Gly Lys
130 135 140

Lys Trp Arg Ile Ile Val Phe Lys Ser Phe Thr Ser Phe Leu Gln Asp
145 150 155 160

Ser Gly Glu Leu Asp Pro Met Val Asn Pro Gly Arg Phe Leu Lys Val
165 170 175

Pro Pro Ala Arg Arg Asn His Glu Leu Lys Gly Tyr Ser Ile Glu His
180 185 190

Val Gln Gln Leu Tyr Ala Ala Leu Gly Ser Gln Ala Ile Arg Asp Val
195 200 205

Leu Cys Leu Gln Ala Lys Thr Gly Met His Gly Thr Glu Val Asp Arg
210 215 220

Leu Ala Ser Gly Asp Gly Lys Ile Ala Val Leu Lys Asp Gln Gly Glu
225 230 235 240

Ile Ala Ala Thr Val Thr Phe Lys His Lys Thr Gly Lys Pro Phe Thr
245 250 255

Leu Ser Leu Asp Val Gln Gly Leu Ala Ala Ala Gln Arg Leu Gln Ala
260 265 270

Arg Gly Ser Ala Pro Asp Arg Gln Thr Ile Arg Glu Ala Val Glu Arg
275 280 285

Val Cys Ala Arg Thr Ser Leu Glu Phe Val His Phe Gly Ala Ile Arg
290 295 300

His Ser Phe Ala Thr Trp Leu Val Glu Gln Gly Ser Ile Tyr Asn Pro
305 310 315 320

Lys Gly Gly Gly Leu Ser Leu Glu Ala Val Ala Gln Ala Leu Asn His
325 330 335

Ser Ser Thr Arg Thr Thr Ala Leu His Tyr Val Ser Ala Thr Val Pro
340 345 350

Pro Met Tyr Val Val Pro Ile Arg Leu Glu His Ser Asn Asp Pro Ser
355 360 365

Glu Leu Arg Ile Ala Arg Ala Pro Ala Gly
370 375

<210> 6

<211> 388

<212> PRT

<213> Angiococcus disciformis

<400> 6

Met Thr Asp Asp Ser Thr Pro Thr Asp Glu Thr Gln Ile Glu Ala Pro

1

5

88
10

15

Thr Pro Glu Asn Thr Ser Asp Leu Lys Gly Ala Arg Pro Arg Leu Arg
20 25 30

Phe Thr Ile Glu Thr Thr Thr Tyr Glu Thr Leu Arg Thr Leu Glu Arg
35 40 45

Arg Gly Asn Gly Glu Val Val Leu Leu Ala Glu Arg His Leu Pro His
50 55 60

Gly Leu Ala Gly Leu Val Thr Ile Lys Arg Leu Arg Asn Pro Val Thr
65 70 75 80

Phe Glu Arg Cys Gln Arg Leu Ile Glu Glu Val Gln Leu Ser Phe Arg
85 90 95

Leu His His Pro Ala Ile Ala Gln Val His His Leu Lys Ile His Ala
100 105 110

Asp Arg Pro His Val Ile Ala Glu Tyr Val Asp Gly Pro Thr Leu Asp
115 120 125

Thr Ile Ile Ser Leu Ala Thr Met Arg Glu Lys Pro Leu Ser Ala Pro
130 135 140

Phe Ala Leu Tyr Ile Ala Ala Glu Val Ala Asp Ala Leu His His Ala
145 150 155 160

His Thr Leu Arg Asp Ser Glu Asn Arg Pro Leu Gly Ile Ile His Arg
165 170 175

Asp Val Ala Pro Arg Asn Ile Arg Val Ala Arg Ser Gly Glu Val Lys
180 185 190

Val Thr Asp Phe Gly Ala Thr Tyr Ser Leu Met Val Gly Arg Glu Glu
195 200 205

Thr Pro Gly Leu Leu Leu Lys Gly Asp Val Ala Tyr Ala Ser Pro Glu
210 215 220

Tyr Leu Asn Arg Lys Pro Met Asp Gly Arg Ser Asp Ile Phe Ser Leu
225 230 235 240

Gly Leu Val Leu Met Glu Met Leu Thr Cys Lys His Leu Phe Asp Val
245 250 255

Glu Asp Glu Lys Ala Pro Asn Ala Thr Val Asp Val Lys Thr Glu Glu
260 265 270

Thr Pro Ser Val Pro Leu Thr Gln Met Ile Ala Leu Val Asn Arg Tyr
275 280 285

Arg Pro Glu Asp Val Glu Asn Ala Met Ala Gly Leu Pro Asp Ala Leu
290 295 300

Lys Ala Ile Val His Lys Ala Leu Gln Arg Lys Leu Ser Glu Arg Tyr
305 310 315 320

Ala Thr Ala Ala Glu Met Arg Asp Ala Leu Arg Ala Ala Leu Ala Ala
325 330 335

Glu Ser Gln Pro Phe Gly Arg Lys Glu Ala Ser Glu Glu Leu Ala Arg
340 345 350

Met Leu Ser Glu Ala Ser Val Leu Arg Asp Arg Val Glu Leu Asp Glu
355 360 365

Glu Gly Ile Phe Pro Glu Gly Leu Asp Ala Asp Glu Pro Thr Pro Ala
370 375 380

Pro Asn Glu Glu
385

<210> 7

<211> 640

<212> PRT

<213> *Angiococcus disciformis*

<400> 7

Val Glu Glu Lys Leu Gly Ala Gly Gly Phe Gly Ala Val Tyr Arg Ala
1 5 10 15

Arg Arg Gly Gly Arg Leu Tyr Ala Leu Lys Leu Ile Pro Leu Trp Gly
20 25 30

Leu Ala Glu Trp Ala Glu Arg Glu Val Ala Ile Leu Leu Arg Leu Lys
35 40 45

His Ser Asn Leu Val Arg Ile Arg Gly His Gly Gln Trp Pro Asp Glu
50 55 60

Ala Pro Gln Ser Phe Phe Ile Val Met Asp Tyr Val Glu Gly Arg Arg
65 70 75 80

Leu Asp Val Trp Ala Arg Glu Glu Asn Pro Ser Ala Arg Glu Val Val
85 90 95

Leu Lys Val Arg Gly Val Ala Arg Gly Leu Gly Ala Ala His Arg Ala
100 105 110

Lys Val Val His Arg Asp Leu Lys Glu Ser Asn Val Ile Glu Arg Thr
115 120 125

Ser Asp Gly Glu Ala Val Val Val Asp Phe Gly Ala Gly Gly Tyr Glu
130 135 140

Ser Ala Pro Ser Ile Thr Gly Gly Val Leu Pro Pro Gly Thr Pro Glu
145 150 155 160

Tyr Arg Ala Pro Glu Ala Trp Arg Phe Gln Gln Glu His Gly Asp Glu
165 170 175

Arg Gly His Ser Tyr Gln Pro Gly Pro Ser Asp Asp Leu Tyr Ser Leu
180 185 190

Gly Val Val Leu Tyr Trp Leu Leu Thr Gly Arg Gln Pro Phe Leu Pro
195 200 205

Asp Glu Ala Ala Gly Val Glu Ala Val Leu Asn Arg Ala Pro Lys Pro
210 215 220

Pro His Val Leu Asn Pro Arg Val Pro Glu Ala Leu Ser Ala Val Cys
225 230 235 240

Met Arg Leu Leu Ala Lys Glu Pro Glu Glu Arg His Pro Asp Ala Asp
245 250 255

Ala Leu Cys Ala Glu Leu Glu Ala Leu Leu Ala Gln Ala Asp Glu Ser
260 265 270

Trp Asp Val Lys Leu Cys Asp Ala Tyr Gly Pro Asp Thr Ala Thr Thr
275 280 285

Leu Ala Ala Val Pro His Ala Gly Glu Asp Glu Leu Val Gln Trp Leu
290 295 300

Lys Lys Arg Lys Ala Arg Pro Arg Arg Gly Pro Arg Pro Pro His Gly
305 310 315 320

Glu Gly Ala His Glu Pro Asp Ser Asn Ala Val Ala Ile Gln Ala Glu
325 330 335

Leu Pro Pro Pro Val Pro Ala Arg Pro Gly Pro Met Pro Ser Pro Pro
340 345 350

Pro Ala Gln Ala Gly His Phe Lys Ala Leu Arg Val Ala Thr Trp Met
355 360 365

Gly Leu Leu Val Val Leu Ser Ala Gly Ala Leu Val Ile Ala Arg Thr
370 375 380

Leu Ala Pro Ser Pro Ala Pro Ala Ala Arg His Ala Leu Glu Pro His
385 390 395 400

Pro Ser Asp Ala Val Asp Ser Pro Pro Ala Ser Pro Glu Phe Asp Leu
405 410 415

Ala Pro Trp Ala Pro Gly Gln Glu Val Ala Ala Pro Trp Met Ala Pro
420 425 430

Glu Ala Gln Glu Ala Ala Ala Ala Leu Asp Ser Ala Pro Thr Leu Ala
435 440 445

Ala Val Ala Leu Pro Ala Thr Ile Ser Glu Glu Lys Ala Ser Val Lys
450 455 460

Met Lys Lys Asn Thr Gly Val Phe Ser Glu Pro Glu Pro Gln Arg Phe
465 470 475 480

Arg Gly Gly Thr Val Gly Lys Ala Leu Gly Leu Gly Val Ala Gly Cys
485 490 495

Leu Ala Met Ala Cys Pro Gly Pro Gln Val Arg Pro Thr Pro Pro Pro
500 505 510

Glu Ala Cys Pro Pro Gly Ala Val Glu Ala Met Ser Arg Leu Arg Ile
515 520 525

Glu Tyr Asp Glu Asp Val Val Ala Thr Phe Phe Ala Thr Ala Glu Glu
530 535 540

Gly Val Ser Arg Asn Ile Thr Val Arg Ala Gly Pro Thr Thr Val His
545 550 555 560

Leu Gly Arg Pro Leu Gly Asn Leu Pro Ala Arg Thr Thr Leu Ser Gly

Arg Leu Ile Ile Gly Glu Asp Arg Val Tyr Gly Arg Leu Thr Glu Ala
580 585 590

Arg Thr Pro Lys Gly Asp Arg Phe Pro Val Cys Met Gln Ile Ile Glu
595 600 605

Asn Asp Ser Ile Gly Phe Lys Lys Glu Ile Asn Asp Gly Ser Asn Ser
610 615 620

Ala Ser Val Tyr Pro Tyr Phe Asp Val Lys Ala Val Arg Arg Phe Glu
625 630 635 640

<210> 8

<211> 306

<212> PRT

<213> Angiococcus disciformis

<400> 8

Met Ser Pro Ile Val Val Leu Leu Val Ile Ala Leu Phe Ser Gly Ala
1 5 10 15

Ala Ala Ala Gln Ser Arg Pro Ala Ala Thr Gly Leu Gly Val Arg Arg
20 25 30

Ile Glu Phe Ser Ala Glu Asn Phe Glu Ala Met Thr Thr Pro Glu Val
35 40 45

Gln Ile Ser Pro Gly Val Ser Thr Thr Phe Glu Phe Asn Ser Ala Leu
50 55 60

Leu Gln Glu Lys Val Ala Val Glu Gly Ala Asp Arg Phe Ser Leu Val
65 70 75 80

Asp Ile Gly Arg Ser Thr Leu Arg Leu Val Pro Ser Glu Gln Val Leu
85 90 95

Pro Gly Glu Arg Leu Arg Val Thr Val Arg Phe Leu Asp Gly Ala Ala
100 105 110

Pro Val Gly Met Ala Phe Ile Leu Val Ala His Pro Ala Gln Ala Glu
115 120 125

Arg Leu Val Glu Val Trp Arg Asn Gln Arg Thr Val Glu Ser Tyr Gln
 130 135 140

Gln Glu Ser Lys Glu Ala Arg Ala Glu Ala Gln Arg Cys His Glu Glu
 145 150 155 160

Asn Glu Arg Leu Arg Ala Glu Tyr Ala Gly Pro Gly Gly Leu Ala Gly
 165 170 175

Leu Leu Ala Asn Arg Val Ile Gly Lys Ser Gly Val Ser Val Lys Pro
 180 185 190

Leu Asp Phe Glu Lys Glu Val Arg Gln Arg Pro Gly Asp Ala Ile Arg
 195 200 205

Ile Leu Arg Ala Trp Ser Tyr Arg Ser Ala Asn Arg Val Ser Val Leu
 210 215 220

Met Asp Leu Asp Tyr Pro Glu Ala Ala Gln Arg Trp Ile Ala Gln Gly
 225 230 235 240

Ala Ser Leu Val Ser Lys Thr Gly Glu Thr Leu Ser Met Leu Pro Val
 245 250 255

Trp Gln Glu Ala Pro Val Ala Asn Ala Arg Ile Arg Arg Leu Val Val
 260 265 270

Glu Ala Glu Ala Glu Pro Asp Ala Ala Gln Asp Thr Phe Thr Leu Lys
 275 280 285

Leu Trp Glu Ser Asn Gly Leu Arg Thr Ile Thr Leu Ser Gly Val Thr
 290 295 300

Phe Pro
 305

<210> 9

<211> 180

<212> PRT

<213> Angiococcus disciformis

<400> 9

Met Thr Leu Tyr Glu Leu Phe Glu Ala Asp Asp Asp Arg Asp Val Pro
 5 10 15

Ala Asp Phe Pro Trp Leu Leu Ile Glu Ile Pro Glu Glu Gln Leu Arg
 20 25 30

His Ala Ala Leu Leu Leu Asn Glu Gly Glu Trp Arg Pro Ser His Ile
 35 40 45

Ser Gly Ile Trp Tyr Arg Val Asp Pro Glu Arg Pro Ala Gln Lys Gln
 50 55 60

Gln Arg His Val His Val Ala Ala Lys Lys His Ile Lys Ile Pro Thr
 65 70 75 80

Lys Gln Ala Ser Trp Asn Arg Asp Thr Thr Arg His Asp Arg Lys Thr
 85 90 95

Phe Asn Ala Lys Leu Gly Ser Gln Gly Ser Tyr Gln Asp Val Ala Lys
 100 105 110

Thr Ala Leu Gly Leu Pro Pro Glu Ala Val Leu Glu His Val Val Glu
 115 120 125

Asn Pro Ala Glu Gln Gln Met Leu Leu Thr Glu Ser Thr Asp Pro Gln
 130 135 140

Leu Lys Thr Glu Phe Tyr Arg Trp Leu Glu Ala Gln Pro Arg Arg Ser
 145 150 155 160

Asn Phe Glu Ala Leu Val Glu Asp Ala Val Arg Leu Asn Leu Pro Leu
 165 170 175

Asp Leu Glu Ser
 180

<210> 10

<211> 390

<212> PRT

<213> *Angiococcus disciformis*

<400> 10

Val Ala Leu Gln Arg Arg His Pro Leu Leu Arg Ala Lys Ile Val Ala
 1 5 10 15

Gly Thr Pro Pro Arg Phe Thr Ser Gln Gly Val Pro Pro Ile Ala Leu
 20 25 30

Glu Val Val Glu Arg Lys Ala Glu Glu Ser Trp Gln Gln His Val Glu
 35 40 45

Ala Glu Leu Asp Arg Pro Phe Asn Ser Asp Pro Gly Pro Leu Val Arg
 50 55 60

Phe Ile Leu Val Arg Gly Glu His Arg Ser Glu Leu Leu Cys Ser Tyr
 65 70 75 80

Asp His Leu Ile Gly Asp Ala His Ser Gly Ile Phe Ala Leu Arg Asp
 85 90 95

Leu Leu Gln Val Met Ala Ser Gln Asp Gln His Leu Pro Glu Leu Ala
 100 105 110

Pro Arg Pro Ala Tyr Glu Glu Leu Ile Gly Pro Met Val Pro Gly Thr
 115 120 125

Arg Leu Leu Gly Ala Ala Val Arg Arg Gly Ser Ser Ala Leu Leu Arg
 130 135 140

Leu Ser Pro Thr Leu Asn Thr Leu Thr Glu Arg Leu Val Ala Pro Arg
 145 150 155 160

Gly Met Ala Arg Ser Ser Ala Glu Gly Gln Ala Leu Tyr Ser His Arg
 165 170 175

Ile Leu Glu Pro Glu Gln Leu Ala Arg Leu Leu Ala Arg Cys Arg Glu
 180 185 190

Gln Gly Ser Ser Val His Ala Ala Leu Gly Ala Ala Leu Leu Ile Ala
 195 200 205

Arg Ala Glu Ser Gln Gly Ala Lys Lys Arg Val Thr Leu Thr Leu Thr
 210 215 220

Ser Ala Leu Asp Ala Arg Glu Arg Phe Gly Val Gly Glu Asp Phe Gly
 225 230 235 240

Leu Phe Thr Thr Gly Lys Thr Asp Phe Phe Arg Ala Arg Gly Ser Thr
 245 250 255

Pro Phe Trp Glu Leu Ala His Arg Leu Arg Ser Pro Leu Gln Ala Ala
 260 265 270

Arg Lys Lys Arg Ser His Leu Arg Leu Phe Arg Leu Ile Leu Glu Ile

275

280

285

Ser Ala Leu Thr Val Asp Ile Ser Ser Gln Pro Trp Met Glu Arg Ala
290 295 300

Thr Arg Leu Gly Leu His Ser Met Leu Ala Leu Ser Asn Val Gly Arg
305 310 315 320

Val Glu Ile Ala Ala Arg Tyr Gly Asn Leu Thr Leu Glu Gly Leu Gly
325 330 335

Phe Thr Gly Thr Thr Ala Ala Gln Phe Asp Val Val Leu Thr Ala Ile
340 345 350

Thr Phe Ala Gln Arg Leu Glu Ala Ser Phe Leu Phe Asn Thr Ala His
355 360 365

Met Gln Arg Glu Gln Val Glu Gln Leu Ala Ser Arg Thr Trp Glu Leu
370 375 380

Leu Ala Glu Ala Thr Arg
385 390

<210> 11

<211> 1541

<212> PRT

<213> Angiococcus disciformis

<400> 11

Met Thr Leu Asp Ser Arg Tyr Ala Asn Arg Gly Gly Gly Leu Tyr Glu
1 5 10 15

Ile Asp Gly Leu Ala Ile Gly His Ser Pro Pro Pro Cys Ser Ile Pro
20 25 30

Gly Gly Val Gln Leu Thr Ala Thr Ala Thr Ala Glu His Ala Leu Lys
35 40 45

Ala Leu Arg Ala Lys Gly Leu Ala Thr Ser Asp Glu Ala Leu Pro Ala
50 55 60

Val Arg His Ala Ser Gly Glu Lys Ala Pro Leu Ser Ser Ser Gln Arg
65 70 75 80

Arg Met Trp Phe Leu Glu Gln Leu Glu Pro Gly Asn Ala Ala Gln His
85 90 95

Leu Leu Gln Ser His His Ile Gln Gly Pro Leu Gln Val Glu Gly Leu
100 105 110

Arg Arg Ala Leu Gly Leu Met Val Lys Arg His Glu Ala Leu Arg Leu
115 120 125

Val Val Ala Ile Gly Ala Ala Gly Pro Glu Gln Arg Val Arg Pro Glu
130 135 140

Trp Trp Pro Glu Leu Pro Leu Ser Asp Leu Ser Gly Val Ala Gln Ala
145 150 155 160

Asp Arg Ala Arg Ala Leu Ala Glu Leu Ala Arg Val Glu Ala Ala Ala
165 170 175

Pro Phe Asn Leu Gln Gln Gly Pro Leu Phe Arg Val Arg Leu Ala Arg
180 185 190

Leu Ala Glu Thr Glu His Val Leu Leu Val Thr Leu His His Leu Ile
195 200 205

Ser Asp Gly Ala Trp Ser Cys Glu Val Leu Ile Lys Glu Leu Ala Met
210 215 220

Leu Tyr Gly Gln His Val Glu Gly Ser Ser Pro Glu Leu Ala Pro Leu
225 230 235 240

Pro Val Gln Tyr Arg Asp Tyr Ala Gly Trp Glu Ala Ser Phe Ala Pro
245 250 255

Ala Gly Glu Ala Leu Glu Ala Trp Trp Arg Gln Arg Leu Ala Gly Val
260 265 270

Pro Thr Val Leu Glu Leu Pro Thr Glu Gly Ala Arg Pro Leu Arg Gln
275 280 285

Thr Tyr Arg Ala Gly Arg Val Ala Ile Thr Val Gln Pro Arg Leu Arg
290 295 300

Gln Ala Leu Glu Asp Leu Ala His Lys Glu Gly Val Ser Leu Phe Ala
305 310 315 320

Leu Leu Leu Thr Ala Phe Thr Thr Leu Leu His Arg Tyr Ser Arg Gln
325 330 335

Glu Glu Leu Val Val Gly Trp Pro Ala Pro Gln Arg Pro Arg Pro Glu
340 345 350

Leu His Gly Leu Ile Gly Tyr Phe Gly Thr Pro Val Ala Leu Arg Ser
355 360 365

Arg Leu Glu Pro His Thr Arg Val Arg Glu Ala Leu Arg Gln Leu Asp
370 375 380

Gln Glu Val Arg Glu Ala Asn Ala His Ala Ala Leu Pro Phe Glu Arg
385 390 395 400

Leu Val Ser Leu Leu Asp Ile Ala Arg Ser Pro Ser Arg His Pro Leu
405 410 415

Phe Gln Val Leu Phe Asp Leu Leu Pro Glu Gln Pro Gln Pro Thr Ala
420 425 430

Gly Gly Cys Ala Phe Arg Pro Trp Glu Ser Phe Thr Gly Leu Val Ala
435 440 445

Tyr Asp Leu Thr Leu Leu Leu Glu Pro Arg Gly Glu Gly Leu Glu Gly
450 455 460

Ala Leu Asp Tyr Ser Ala Asp Leu Phe Ser Glu Ala Arg Met Gln Arg
465 470 475 480

Ala Ala Thr Gln Tyr Leu His Leu Leu Glu Gln Leu Val Glu Arg Pro
485 490 495

His Glu Arg Leu Ser Arg Leu Ala Leu Leu Thr Pro Gly Glu His Glu
500 505 510

Ala Leu Leu Ala Gly His Gly Leu Gly Gly Pro Val Glu Gly Ala Gln
515 520 525

Val Leu Ala His His Arg Phe Glu His Gln Val Arg Leu Thr Pro His
530 535 540

His Pro Ala Leu Cys Phe Gly Pro Gln Val Leu Ser Tyr Glu Gln Leu
545 550 555 560

Asn Arg Arg Ala Asn Pro Leu Ala His Arg Leu Arg Arg Leu Gly Ala
565 570 575

Gly Pro Asp Thr Leu Val Gly Leu Cys Val Glu Arg Ser Leu Glu Leu
580 585 590

Pro Val Ala Leu Leu Ala Ile Trp Lys Ala Gly Ala Gly Phe Leu Pro
595 600 605

Leu Asp Val Asn Gln Pro Arg Glu Arg Leu Ala Phe Leu Leu Gly Asp
610 615 620

Ala Ser Cys Arg Ile Leu Leu Thr Gln Glu His Leu Leu Gln Arg Leu
625 630 635 640

Pro Pro Thr Asn Ala Ala Leu Leu Cys Leu Glu Arg Glu Ala Glu Ala
645 650 655

Leu Glu Arg Glu Pro Gln Glu Asp Ala Pro His Glu Ala Gly Leu Asp
660 665 670

Asn Leu Ala Tyr Val Ile His Thr Ser Gly Ser Thr Gly Thr Pro Lys
675 680 685

Gly Ile Ala Met Val His Arg Cys Leu Ala Asn Leu Val Ala Trp Gln
690 695 700

Leu Thr His Glu Arg Leu Gly Gly Pro Ser Arg Thr Leu Gln Phe Ala
705 710 715 720

Ser Leu Asn Phe Asp Ile Cys Tyr Gln Glu Leu Phe Thr Thr Trp Ala
725 730 735

Ala Gly Gly Thr Val Val Met Val Thr Glu Glu Val Arg Arg Asp Pro
740 745 750

Ala Arg Leu Leu Glu Val Leu Glu Gln Glu Gln Val Ser Arg Leu Tyr
755 760 765

Leu Pro Phe Ile Ala Leu Gln Gln Leu Ala Arg Val Ala Asp Glu Arg
770 775 780

Gly Ala Ala Pro Arg His Leu Arg Gln Leu Ile Thr Ala Gly Glu Gln
785 790 795 800

Leu Gln Ala Thr Pro Glu Leu Gln Arg Leu Leu Ser Arg Met Pro Glu
805 810 815

Cys Thr Leu His Asn Gln Tyr Gly Pro Ser Glu Cys His Val Val Thr
820 825 830

Ser His Asp Leu Thr Arg Glu Pro Ser Arg Trp Pro Arg Leu Pro Pro

835

840

845

Val Gly Arg Pro Leu Ala His Leu Arg Val Leu Leu Leu Asp Gly Glu
850 855 860

Gln Gln Leu Val Pro Pro Gly Val Ala Gly Glu Val Phe Leu Gly Gly
865 870 875 880

Pro Ala Leu Ala Arg Gly Tyr Leu Gly Arg Pro Glu Gln Thr Ala Asp
885 890 895

Arg Phe Val Pro Asp Pro Phe Ser Arg Glu Pro Gly Ala Arg Leu Tyr
900 905 910

Arg Thr Gly Asp Leu Ala Arg Leu Arg Glu Asp Gly Ala Leu Glu Phe
915 920 925

Leu Gln Arg Met Asp Ala Gln Val Lys Ile Arg Gly Tyr Arg Ile Glu
930 935 940

Pro Gly Glu Ile Glu Val Val Leu Cys Glu His Pro Ala Val His Gln
945 950 955 960

Ala His Val Arg Pro Tyr Val Asp Ser Ala Gly Glu Arg Arg Leu Val
965 970 975

Ala Tyr Val Ala Ala Arg Leu Glu Asp Thr Asp Gly Ala Glu Thr Glu
980 985 990

His Val Glu Arg Trp Arg Ala Val Trp Asp Glu Thr Tyr Gly Gly Pro
995 1000 1005

Ser Gly Thr Ala Phe Asp Leu Ala Gly Trp Asn Asp Ser Val Arg
1010 1015 1020

Gly Glu Pro Leu Pro Pro Glu Gln Met Arg Glu Trp Val Glu Thr
1025 1030 1035

Thr Val Glu Arg Leu Met Glu Leu Val Pro Arg Arg Val Leu Glu
1040 1045 1050

Leu Gly Cys Gly Ser Gly Leu Leu Leu Arg Arg Leu Ala Pro Arg
1055 1060 1065

Cys Glu Ser Tyr Trp Gly Thr Glu Leu Ser Pro Val Ala Val Glu
1070 1075 1080

Arg Leu 1085	Arg Glu Gln Leu Gln 1090	Thr Gly Gly Ser Pro 1095	Leu Ala Gln
Arg Val 1100	Arg Leu Met Ala Gln 1105	Pro Ala Asp Asp Phe 1110	Ser Gly Leu
Pro Glu 1115	Ala Gly Phe Asp Thr 1120	Val Ile Leu Asn Ser 1125	Val Thr Gln
Leu Phe 1130	Pro Ser Val Asp Tyr 1135	Leu Leu Arg Val Val 1140	Glu Gly Ala
Leu Arg 1145	Val Leu Gln Pro Gly 1150	Gly Thr Leu Phe Ile 1155	Gly Asp Val
Gln Asn 1160	Leu Arg Leu Phe Glu 1165	Leu Phe His Ala Ser 1170	Val Ala Leu
Glu Gln 1175	Ala Ser Ala Asp Leu 1180	Glu Ala Pro Ala Leu 1185	Leu Ala Arg
Thr Arg 1190	Gln Arg Met Leu Leu 1195	Asp Glu Arg Leu Tyr 1200	Val Asp Pro
Asp Phe 1205	Phe Ala Ala Leu Ala 1210	Thr His Phe Pro Gln 1215	Leu Gly Ala
Val Arg 1220	Leu His Leu Lys Arg 1225	Gly Ser Gly Arg Asn 1230	Glu Met Asn
Arg Phe 1235	Arg Tyr Asp Val Glu 1240	Leu Gln Leu Ala Pro 1245	Val Ala Lys
Ala Gly 1250	Pro Ala Gln Glu Leu 1255	Pro Glu Leu Asp Trp 1260	Arg His Glu
Gly Leu 1265	Gly Leu Glu Arg Leu 1270	Glu Arg Met Leu Ala 1275	Glu Arg Pro
Ala Gly 1280	Leu Val Leu Arg Asn 1285	Val Ala Asn Ala Arg 1290	Thr Ala Asp
Glu Ala 1295	Ala Arg Leu Ala Leu 1300	Leu Arg Thr Gly Asn 1305	Ser Val Gly
Arg Leu 1310	Arg Ala Leu Pro Ala 1315	Val Thr Ser Trp Asn 1320	Pro Glu Gln

Leu Trp Arg Leu Ala Glu Ala Ala Asp Tyr Thr Cys His Val Thr
 1325 1330 1335
 Trp Ser Ala Gln Asp Glu Glu Gly Arg Phe Asp Ala Leu Leu Met
 1340 1345 1350
 Ala Arg Ala Ala Gly Ser Ser Arg Pro Ala Ala Trp Leu Thr Pro
 1355 1360 1365
 Pro Pro Pro Pro Pro Arg Pro Trp Lys Ser Tyr Ala Asn Gln Pro
 1370 1375 1380
 Leu Ala Ala Ser Arg Arg Arg Thr Leu Val Gly Val Leu Arg Ser
 1385 1390 1395
 His Leu Glu His Lys Leu Pro Glu Tyr Met Val Pro Ser Ser Phe
 1400 1405 1410
 Val Leu Leu Asp Ala Leu Pro Leu Lys Pro Thr Gly Lys Leu Glu
 1415 1420 1425
 Val Ala Ala Leu Pro Pro Pro Glu Pro Ala Gln Ala Glu Gln Thr
 1430 1435 1440
 Pro Gly His Leu Ala Pro Arg Thr Pro Thr Glu Arg Arg Leu Ala
 1445 1450 1455
 Glu Leu Trp Arg Arg Val Leu Gly Val His Arg Val Gly Val Glu
 1460 1465 1470
 Asp Asn Phe Phe Gln Leu Gly Gly His Ser Leu Leu Ala Thr Arg
 1475 1480 1485
 Leu Leu Ser Leu Ile Arg Gly Glu Leu Gly Leu Glu Leu Pro Leu
 1490 1495 1500
 Arg Val Leu Phe Glu Gln Pro Thr Leu Ala Ala Met Ala Gly Cys
 1505 1510 1515
 Leu Glu Ala Gln Ser Trp Ser Thr Gln Ala Pro His Pro Pro Ser
 1520 1525 1530
 Ala Ser Ile Glu Glu Gly Glu Leu
 1535 1540

<211> 3515

<212> PRT

<213> *Angiococcus disciformis*

<400> 12

Met Thr Pro Ser Gly Asp Glu Ala Leu Gln Ser Ser Ile Ala Leu Val
 1 5 10 15

Gly Met Ala Gly Arg Phe Pro Gly Ala Pro Asp Val Glu Ser Phe Trp
 20 25 30

Arg Asn Leu Val Ala Gly Val Glu Ser Ile Ser Phe Phe Ser Glu Glu
 35 40 45

Glu Leu Arg Gln Ala Gly Val Ser Glu Gln Ile Arg Arg Arg Pro Glu
 50 55 60

Tyr Val Pro Ala Lys Gly Val Leu Glu Asp Leu Glu Leu Phe Asp Ala
 65 70 75 80

Gly Phe Phe Gly Tyr Ser Pro Arg Glu Ala Ser His Leu Asp Pro Gln
 85 90 95

Gln Arg Leu Leu Leu Glu Cys Ser Trp Glu Ala Leu Glu Asp Ala Gly
 100 105 110

Leu Arg Pro Asp Gln Leu Pro Gly Trp Val Gly Val Tyr Val Gly Ala
 115 120 125

Gly Asp Thr Ser Tyr Arg Phe Gln Leu Leu Arg Gly His Gly Asp Pro
 130 135 140

Leu Ser Gly Ser Lys Asp Val Ala Gly Phe Phe Gly Asn Tyr Pro Asp
 145 150 155 160

Phe Leu Ala Thr Arg Val Ala Tyr Lys Leu Asn Leu Arg Gly Pro Ala
 165 170 175

Leu Gly Ile His Thr Ala Cys Ser Thr Ser Leu Val Ser Ile Asn Met
 180 185 190

Ala Cys Ser Ala Leu Arg Gly Phe Glu Cys Asp Met Ala Leu Ala Gly
 195 200 205

Gly Val Ser Leu Arg Leu Pro Ala Arg Ser Gly Tyr Leu Tyr Glu Glu

210

215

220

Gly Gly Val Ala Ser Lys Asp Gly His Cys Arg Pro Phe Asp Ala Arg
 225 230 235 240

Ala Thr Gly Thr Val Thr Gly Asp Gly Val Gly Val Val Val Leu Lys
 245 250 255

Arg Leu Glu Asp Ala Leu Lys Ala Arg Asp Pro Ile His Ala Val Ile
 260 265 270

Arg Gly Trp Ala Leu Asn Asn Asp Gly Ala Ser Arg Ala Gly Phe Thr
 275 280 285

Ala Pro Ser Val Glu Gly Gln Ser Glu Val Ile Ala Leu Ala His Ala
 290 295 300

Ala Ala Gly Ile Ser Ala Arg Asp Ile Thr Tyr Val Glu Ala His Gly
 305 310 315 320

Thr Gly Thr Pro Leu Gly Asp Pro Ile Glu Val Ala Ala Leu Thr Arg
 325 330 335

Ala Phe Arg Ala His Thr Ala Asp Thr Ala Phe Cys Thr Leu Gly Ala
 340 345 350

Val Lys Ser Asn Ile Gly His Leu Asp Ala Ala Ala Gly Val Ala Gly
 355 360 365

Val Ile Lys Thr Val Gln Ala Leu Arg His Arg Leu Ile Pro Pro Thr
 370 375 380

Leu His Phe Glu Arg Pro Asn Pro Ala Leu His Leu Glu Gln Ser Pro
 385 390 395 400

Phe Phe Val Asn Thr Gln Pro Leu Pro Trp Glu Ser Pro Arg Gly Pro
 405 410 415

Arg Leu Ala Gly Val Ser Ser Phe Gly Ile Gly Gly Thr Asn Ala His
 420 425 430

Thr Leu Phe Glu Glu Ala Pro Pro Pro Pro Ala Ser Gly Pro Thr Arg
 435 440 445

Asp Gln Val Leu Leu Leu Ser Ala Arg Ser Thr Ser Ala Leu Glu
 450 455 460

His Ile Ala Gly Arg Leu Ala Ala His Leu Arg Arg His Pro Asp Leu
465 470 475 480

Glu Leu Ala Asp Val Ala Phe Thr Leu Gln Val Gly Arg Ala Arg Phe
485 490 495

Pro Tyr Arg Arg Ala Leu Thr Cys Arg Thr Leu Ala Glu Ala Met Glu
500 505 510

Arg Leu Glu Ala Pro Glu Pro Arg Pro Pro Glu Pro Leu Ala His Glu
515 520 525

Gly Glu Arg Pro Pro Leu Val Met Leu Phe Pro Gly Gln Gly Thr Pro
530 535 540

Leu Val Gly Thr Ala Arg Ala Leu His Glu Ser Glu Pro Thr Phe Arg
545 550 555 560

Gln Ala Val Glu Gln Cys Ala Arg Leu Leu Arg Gln Thr Leu Gly Leu
565 570 575

Asp Val Arg Glu Val Leu Phe Pro Ser Ala Glu Gln Glu Glu Gln Ala
580 585 590

Arg Arg Leu Ala Ala Gln Thr Arg Val Ala Gln Pro Ala Leu Phe Thr
595 600 605

Leu Glu Tyr Ala Leu Ala Gln Thr Trp Leu Gly Trp Gly Leu Gln Pro
610 615 620

Gln Ala Leu Ala Gly His Ser Leu Gly Glu Leu Val Ala Ala Cys Leu
625 630 635 640

Ala Gly Val Phe Ser Leu Glu Asp Ala Leu Gln Leu Val Ala Ala Arg
645 650 655

Gly Gln Leu Met Gln Gly Cys Pro Pro Gly Ala Met Leu Ala Val Pro
660 665 670

Leu Pro Glu Ala Glu Leu Ala Ala Leu Leu Gly Ser Glu Leu Cys Ile
675 680 685

Ala Ala Val Asn Gly Pro Arg Ala Cys Val Ala Ser Gly Pro Leu Pro
690 695 700

Ala Val Glu Ala Leu Thr Ala Ala Leu Glu Ser Arg Gly Val Ser Ser
705 710 715 720

Ser Glu His Ala Phe Arg Leu Arg Pro Glu Ser Glu Glu Asp Trp Asp
980 985 990

Ala Leu Phe Gln Ala Leu Gln Ser Gln Gly Arg Leu Pro Arg Arg Ile
995 1000 1005

Leu His Ala Trp Ala Leu Thr Ala Glu Pro Gly Pro Cys Thr Pro
1010 1015 1020

Asp Gly Glu Ala Val Leu Glu Gln Gly Phe Phe Ser Leu Leu Arg
1025 1030 1035

Leu Ala Arg Ala Leu Gly Arg His Ala Pro Glu Arg Pro Val Gln
1040 1045 1050

Leu Glu Val Leu Ser Ser Phe Val His Ala Val Gly Pro Arg Glu
1055 1060 1065

Pro Leu Glu Pro Leu Lys Ala Thr Leu Leu Gly Ala Cys Ala Val
1070 1075 1080

Leu Pro Leu Glu Tyr Pro His Val Gln Cys Arg Thr Ile Asp Val
1085 1090 1095

Arg Pro Gly Ser Glu Pro Arg Glu Val Leu Val Arg Ser Leu Ala
1100 1105 1110

Ala Glu Leu Ala Ala Pro Met Gly Glu Ser Pro Val Ala Trp Arg
1115 1120 1125

Asp Gly Gln Arg Tyr Val Arg Arg Ala Thr Arg Gln Arg Leu Glu
1130 1135 1140

Ala Ser Arg Pro Leu Arg Ser Leu Arg Glu Arg Gly Val Tyr Leu
1145 1150 1155

Val Ala Gly Gly Leu Gly Gly Ile Gly Leu Val Leu Ala Arg Ala
1160 1165 1170

Leu Ala Gln Arg Ala Arg Ala Arg Leu Ala Leu Leu Thr His Ser
1175 1180 1185

Pro Phe Pro Pro Arg Glu Gln Trp Glu Gln Trp Leu Glu Glu Ala
1190 1195 1200

Pro Ala His Pro Glu Pro Ala Trp Arg Ser Glu Ala Asp Pro Ser

1205		1210		1215
Glu Arg Arg Arg Thr Gln His	Arg Ile Arg Cys Leu	Leu Glu Leu		
1220	1225	1230		
Glu Gln Leu Gly Ala Glu Val	Gln Val Tyr Thr Ala	Asp Val Ala		
1235	1240	1245		
Glu Glu Ala Ala Val Arg Ser	Val Val Glu Gln Val	His Ala Arg		
1250	1255	1260		
Trp Gly Lys Ile His Gly Val	Leu His Ala Ala Ala	Thr Phe Asp		
1265	1270	1275		
Asp Gly Val Ile Gln Leu Arg	Thr His Glu Gln Ser	Ser Arg Ala		
1280	1285	1290		
Leu Arg Thr Lys Val Arg Gly	Ser Met Val Leu His	Glu Val Leu		
1295	1300	1305		
Ala Ser Glu Gly Leu Asp Trp	Phe Ala Leu Cys Ser	Ser Leu Ala		
1310	1315	1320		
Ser Ala Leu Gly Ser Phe Gly	Gln Ala Asp Tyr Cys	Ala Ala Asn		
1325	1330	1335		
Ala Phe Gln Asp Ala Tyr Ala	His His Leu Arg Arg	Gln Gly Phe		
1340	1345	1350		
Thr Gly Ala Leu Ala Leu Asp	Trp Gly Thr Trp Arg	Asp Thr Gly		
1355	1360	1365		
Ala Ala Met Arg Leu Val Ala	Arg Thr Arg Arg Gly	Gly His Glu		
1370	1375	1380		
Lys Pro Pro Thr Pro Leu Thr	His Pro Leu Phe Asp	Cys Glu Gln		
1385	1390	1395		
Arg Glu Pro Gly Gly Thr His	Trp Leu Gly Leu Thr	Leu Arg Gly		
1400	1405	1410		
Gly Glu Asp Trp Val Val Asp	Glu His Arg Leu Gln	Gly Val Pro		
1415	1420	1425		
Thr Leu Pro Gly Val Ala Tyr	Leu Glu Leu Ala Arg	Ala Ala Cys		
1430	1435	1440		

Ala Gln 1445	Ala Leu Gly 1445	Ala Glu 1450	Ala Val Glu Leu 1455	Glu Leu Leu
Leu Leu 1460	Glu Pro Leu Thr 1465	Val Pro Arg Gly 1470	Glu Ser 1470	Arg Gln Val
Arg Val 1475	Val Leu Gln Pro 1480	Glu Gly Gln Ala His 1485	Ala Leu Arg Val	
Glu Ser 1490	Arg Ser Glu Glu 1495	Ala Arg Gly Trp Asn 1500	Glu His Ala Arg	
Gly Arg 1505	Val Arg Ala Val 1510	Pro Arg Leu Ala Glu 1515	Arg Ile Gln Pro	
Glu Leu 1520	Leu Arg Ala Ala 1525	Cys Glu His Glu Gln 1530	Pro Val Pro Gly	
Glu Pro 1535	Gln Glu Gln Gly 1540	Pro Val His Ala Gly 1545	Ala Arg Trp His	
Gly Leu 1550	Phe Gln Trp Val 1555	Arg Arg Gly Pro Arg 1560	Gln Ala Leu Ala	
Gln Leu 1565	Ala Leu Pro Glu 1570	Pro Phe His Gly Asp 1575	Leu Glu Arg Phe	
Glu Leu 1580	His Pro Ala Leu 1585	Met Asp Met Ala Thr 1590	Ser Phe Ala Ile	
Pro Gly 1595	Gly Val Pro Trp 1600	Leu Ala Phe Gly Tyr 1605	Glu Arg Val Leu	
Ile His 1610	Gly Pro Leu Pro 1615	Pro Gln Val Leu Ser 1620	His Val Ser Leu	
Pro Glu 1625	Glu Ser Gln Ala 1630	Gly Ala Gln Gln Leu 1635	Arg Leu Gln Val	
Arg Leu 1640	Leu Asp Leu Glu 1645	Gly Trp Glu Arg Val 1650	Arg Ile Asp Gly	
Tyr Leu 1655	Leu Arg Pro Leu 1660	Lys Pro Ser Asp Ala 1665	Ser Val Glu Pro	
Ala Ala 1670	Pro Asn Val Glu 1675	Val Ala Val Gly Thr 1680	Pro Gly Leu Leu	

Glu Ser Leu Gly Leu Arg Arg Cys Thr Arg Pro Ala Pro Gly Pro
 1685 1690 1695

Arg Gln Val Glu Ile Glu Val Glu Ala Ala Gly Leu Asn Phe Leu
 1700 1705 1710

Asp Val Leu Gly Ala Leu Gly Met Met Pro Ala Leu Glu Ala Glu
 1715 1720 1725

Glu Ser Val Leu Gly Arg Glu Cys Ser Gly Arg Ile Ala Ala Val
 1730 1735 1740

Gly Glu Gly Val Ser Gly Leu Arg Val Gly Asp Glu Val Leu Ala
 1745 1750 1755

Val Ala Pro Gly Cys Phe Arg Ser Tyr Val Leu Val Asp Glu Ser
 1760 1765 1770

Gln Val Val Arg Arg Pro Ala Ser Leu Gly Leu Ala Glu Gly Ala
 1775 1780 1785

Ala Gln Met Val Pro Phe Ala Thr Ala Tyr Phe Ala Leu His Thr
 1790 1795 1800

Val Gly Arg Leu Arg Arg Gly Glu Arg Ile Leu Ile His Ala Ala
 1805 1810 1815

Ala Gly Gly Leu Gly Leu Ala Ala Val Gln Leu Ala Ser Arg Thr
 1820 1825 1830

Gly Ala Glu Ile Leu Ala Thr Ala Gly Ser Glu Gln Lys Arg Glu
 1835 1840 1845

Tyr Leu Arg Ser Leu Gly Ile Ala His Val Leu Asp Ser Arg Ser
 1850 1855 1860

Thr Ser Phe Val Ser Glu Val Arg Glu Arg Thr Gly Gly Arg Gly
 1865 1870 1875

Val Asp Val Val Leu Asn Ser Leu Ala Gly Glu Leu Leu Leu Ala
 1880 1885 1890

Gly Leu Ser Val Leu Ala Pro His Gly Arg Phe Leu Glu Leu Gly
 1895 1900 1905

Asn Arg Asp Leu Tyr Ala Asp Gln Gln Val Gly Leu Arg Thr Leu
 1910 1915 1920

Ala Arg 1925	Gly Gln Thr Phe	Ala 1930	Ala Ile Asp Phe Gly 1935	Pro His His
Pro Asp 1940	Phe Arg Ala Val	Leu 1945	Glu Glu Val Ala Thr 1950	Gln Leu Thr
Gln Gly 1955	Gln Leu Glu Pro	Leu 1960	Pro Thr Arg Leu Phe 1965	Pro Ala Arg
Gln Val 1970	Ala Glu Ala Phe	Ser 1975	Phe Met Ala Arg Ala 1980	Leu His Ile
Gly Arg 1985	Val Ala Val Ser	Met 1990	Gln Gly Ala Thr Ala 1995	Leu Pro Ala
Ser Met 2000	Thr Arg Gly Ser	Arg 2005	Pro Ala Pro Val Ala 2010	Val Pro Pro
Trp Glu 2015	Asp Pro Arg Leu	Ala 2020	Gly Gly Ile Ser Ser 2025	Glu Glu Gly
Ala Glu 2030	Ala Phe Leu Arg	Ala 2035	Leu Glu Gln Gly Ala 2040	Pro Gln Leu
Ile Ile 2045	Ser Pro Gln Asp	Phe 2050	Ser Ser Leu Leu Arg 2055	Gly Leu Gly
Gly Ser 2060	Gln Gly Val Arg	Glu 2065	Lys Glu Arg Leu Val 2070	Thr Gly Arg
Ala Ala 2075	Ala Ala Glu Pro	Gln 2080	Ala Leu Pro Pro Ser 2085	Ser Leu Glu
Gln Leu 2090	Ile Glu Gln Val	Trp 2095	Arg Lys His Leu Gly 2100	Val Glu Arg
Val Gln 2105	Pro Thr Asp Ser	Phe 2110	Phe Gln Leu Gly Gly 2115	Asp Ser Leu
Leu Gly 2120	Ile Gln Val Ala	Ala 2125	Asp Leu Arg Arg His 2130	Leu Gly Val
Glu Leu 2135	Pro Thr Ala Thr	Leu 2140	Phe Ser His Pro Thr 2145	Leu Ala Ala
Leu Ala	Ala Ala Leu Arg Ala	Arg Gln Gly Glu Ala	Ala Ala Pro	

2150

2155

2160

Thr Ala Pro Ala Pro Ala Leu Val Pro Asp Pro Ala Ala Arg Phe
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Glu Pro Phe Pro Leu Thr Asp Val Gln Glu Ala Tyr Trp Val Gly
 2180 2185 2190

Arg Arg Ser Ala Phe Glu Leu Gly Gly Val Ala Ala His Gly Tyr
 2195 2200 2205

Phe Glu Ile Glu Ser Pro Gly Leu Glu Val Glu Arg Phe Ile Gln
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Cys Trp Arg Gln Leu Leu Gln Arg His Asp Met Leu Arg Met Val
 2225 2230 2235

Val Leu Pro Asp Gly Arg Gln Gln Val Leu Glu Gln Val Pro Glu
 2240 2245 2250

Tyr Thr Pro Glu Val Val Glu Leu Arg Gly Leu Ser Pro Gln Glu
 2255 2260 2265

Ala Glu Ser Arg Arg Leu Gln Leu Arg Glu Arg Met Ala His Gln
 2270 2275 2280

Val Leu Arg Ser Asp Arg Trp Pro Leu Phe Glu Leu Val Leu Cys
 2285 2290 2295

Arg Tyr Glu Gly Gly Val Arg Ile His Met Ser Met Asp Ala Leu
 2300 2305 2310

Met Leu Asp Ala Trp Ser Ser Ala Val Leu Arg Gln Asp Phe Ala
 2315 2320 2325

Gln Leu Tyr His Glu Pro Gly Arg Pro Leu Glu Pro Leu Ala Ile
 2330 2335 2340

Thr Phe Arg Asp Tyr Val Leu Ala Glu Arg Arg Leu Arg Glu Gly
 2345 2350 2355

Glu Ala His Glu Arg Ala Arg Ala Tyr Trp Trp Ala Arg Leu Asp
 2360 2365 2370

Thr Leu Pro Pro Pro Pro Glu Leu Pro Leu Val Lys Glu Pro Ser
 2375 2380 2385

Gln Leu Glu His Ala Arg Phe Thr His Arg Glu Ala Arg Leu Glu
2390 2395 2400

Pro His Arg Trp Ala Arg Leu Gln Glu Arg Ala Arg Ala His Gly
2405 2410 2415

Leu Thr Pro Ser Ala Ala Cys Met Ala Ala Phe Ala Glu Val Leu
2420 2425 2430

Ala Arg Trp Ser Arg His Pro Arg Phe Thr Leu Asn Leu Thr Leu
2435 2440 2445

Phe Gln Arg Leu Pro Leu His Pro Gln Val Asp Glu Leu Val Gly
2450 2455 2460

Asp Phe Thr Ser Leu Val Leu Leu Glu Val Glu Ala His Ala Ala
2465 2470 2475

Ser Thr Phe Ala Glu Arg Ala Ser Arg Leu Gln Ala Gln Leu Trp
2480 2485 2490

Arg Asp Leu Glu His Gly Ser Val Ser Ala Val Gln Leu Ile Arg
2495 2500 2505

Glu Leu Val Arg Thr Gly Arg Arg Ser Pro Gly Ala Ile Met Pro
2510 2515 2520

Val Val Phe Thr Ser Ile Leu Ser Leu Asp Ala Arg Arg Gly Pro
2525 2530 2535

Gln Gly Ser Leu Ser Phe Phe Glu Gly Glu Leu Val Tyr Ser Ile
2540 2545 2550

Ser Gln Thr Pro Gln Val Trp Leu Asp His Gly Val His Glu Glu
2555 2560 2565

Glu Gly Ala Leu Val Leu Ala Trp Asp Ser Val Glu Ala Leu Phe
2570 2575 2580

Pro Pro Gly Met Val Asp Asp Met Phe His Ala Tyr Gln Arg Leu
2585 2590 2595

Leu Gly Ala Leu Ala Glu Glu Glu Gln Ala Trp Glu Gly Glu Leu
2600 2605 2610

Pro Glu Leu Leu Pro Pro Ala Gln Arg Glu Leu Leu Ala Arg Tyr
2615 2620 2625

Asn	Ala	Thr	Gln	Ala	Pro	Arg	Pro	Ser	Gly	Arg	Leu	Glu	Glu	Gly
2630						2635					2640			
Phe	Phe	Thr	Gln	Ala	Arg	Leu	His	Pro	Glu	Leu	Pro	Ala	Leu	Leu
2645						2650					2655			
Ala	Pro	Glu	Arg	Thr	Leu	Ser	Tyr	Gly	Glu	Leu	Ala	Arg	Arg	Ala
2660						2665					2670			
Gln	Ala	Leu	Ala	Ala	Arg	Leu	Arg	Glu	Leu	Glu	Val	Gln	Pro	Gln
2675						2680					2685			
Glu	Leu	Val	Ala	Ile	Ala	Met	His	Lys	Gly	Trp	Glu	Gln	Ala	Thr
2690						2695					2700			
Ala	Val	Leu	Gly	Val	Leu	Gln	Ala	Ala	Ala	Ala	Tyr	Leu	Pro	Leu
2705						2710					2715			
Asp	Pro	Glu	Gln	Pro	Pro	Leu	Arg	Leu	His	Gln	Leu	Leu	Glu	Glu
2720						2725					2730			
Gly	Pro	Ala	Arg	Val	Val	Leu	Thr	Gln	Ser	Ser	Leu	Leu	His	Thr
2735						2740					2745			
Val	Pro	Trp	Pro	Pro	Gly	Val	Gln	Val	Ile	Ala	Val	Asp	Glu	Leu
2750						2755					2760			
Glu	Pro	Ala	Thr	Glu	Ala	Pro	Pro	Leu	Pro	Pro	Arg	Gly	Thr	Pro
2765						2770					2775			
Glu	His	Leu	Ala	Tyr	Val	Ile	Tyr	Thr	Ser	Gly	Ser	Thr	Gly	Lys
2780						2785					2790			
Pro	Lys	Gly	Val	Ala	Ile	Glu	His	Arg	Ala	Ala	Leu	Asn	Thr	Val
2795						2800					2805			
Val	Asp	Leu	Asn	Thr	Arg	Phe	Gly	Val	Gly	Pro	Glu	Asp	Arg	Val
2810						2815					2820			
Leu	Gly	Leu	Ser	Ala	Leu	Thr	Phe	Asp	Leu	Ser	Val	Tyr	Asp	Val
2825						2830					2835			
Leu	Gly	Leu	Leu	Gly	Ala	Gly	Gly	Ala	Leu	Val	Leu	Pro	Ala	Ala
2840						2845					2850			
Glu	Ala	Glu	Lys	Asp	Pro	Ala	His	Trp	Trp	Glu	Arg	Leu	Val	Ala
2855						2860					2865			

Gly Arg Val Thr Val Trp Asn Ser Thr Pro Ala Leu Met Leu Leu
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Leu Val Glu Tyr Ala Glu Gln Arg Gly Leu Lys Leu Pro Ala Ala
 2885 2890 2895

Leu Arg Leu Val Met Leu Ser Gly Asp Trp Ile Pro Val Ala Leu
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Pro Asp Arg Ile Arg Ala Leu Gly Arg Asp Val Gln Val Val Ser
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Leu Gly Gly Ala Thr Glu Ala Ser Ile Trp Ser Ile Ala Tyr Pro
 2930 2935 2940

Ile Gly Gln Val Ala Pro Gln Trp Lys Ser Ile Pro Tyr Gly Met
 2945 2950 2955

Pro Leu Ala Asn Gln Arg Phe His Val Leu Asp Gly Arg Leu Glu
 2960 2965 2970

Ala Arg Pro Trp Trp Val Pro Gly Glu Leu Tyr Ile Gly Gly Glu
 2975 2980 2985

Gly Leu Ala Arg Glu Tyr Trp Arg Asp Glu Pro Leu Thr Ala Thr
 2990 2995 3000

Arg Phe Ile Arg His Pro Arg Thr Gly Glu Arg Leu Tyr Arg Thr
 3005 3010 3015

Gly Asp Gln Gly Arg Met Leu Pro Glu Gly Ser Ile Glu Phe Leu
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Gly Arg Glu Asp Leu Gln Val Lys Val Gln Gly Phe Arg Val Glu
 3035 3040 3045

Leu Gly Glu Ile Glu Ala Ala Leu Ala Gln His Pro Ala Leu Ser
 3050 3055 3060

Ala Ser Val Val Val Ala Arg Gly Glu Pro Arg Gly Val Arg Arg
 3065 3070 3075

Leu Val Ala Tyr Ala Val Pro Arg Ser Gly Gln Thr Pro Ala Ala
 3080 3085 3090

Gly Glu Leu Arg Arg Tyr Leu Ala Glu Arg Leu Pro Ala Tyr Met

3095

3100

3105

Val Pro Ser Ala Phe Val Leu Leu Glu Ser Leu Pro Arg Ser Arg
 3110 3115 3120

Asn Gly Lys Ile Ala Arg Asp Gln Leu Pro Glu Pro Gln Gln Thr
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Gln Gly Leu Ala Ala Gln Ala Ala Ala Ala Asp Pro Leu Val Glu
 3140 3145 3150

Arg Leu Ala Ala Leu Val Lys Glu Ala Leu Arg Leu Glu Arg Val
 3155 3160 3165

Glu Pro Gln Asp Ser Leu Leu Asp Leu Gly Ala Asp Ser Val Ala
 3170 3175 3180

Leu Ile Arg Leu Ile Asn Arg Leu Glu Ala Glu Leu Gln Phe Arg
 3185 3190 3195

Pro Arg Leu Ala Asp Ile Tyr Glu Asn Pro Thr Val Gln Gly Leu
 3200 3205 3210

Ala Thr Leu His Gln Glu Lys Thr Lys Ser Gln Gly Glu Gly Gly
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Ala Pro Arg Leu Thr Ala Pro Arg Ser Thr Leu Leu Pro Ala Glu
 3230 3235 3240

Glu Trp Gly Arg Phe Lys Ala Asn Arg Pro Gly Leu Arg Arg Phe
 3245 3250 3255

Pro Asp Gly Thr Pro Glu Val Ala Leu Pro Gly Ser Gly Leu Ala
 3260 3265 3270

Pro Ala Pro Glu Glu Leu Thr Ala Leu Glu Arg Arg Arg Ser Val
 3275 3280 3285

Arg Thr Tyr Ser Leu Glu Pro Val Ser His Glu Gln Leu Gly Arg
 3290 3295 3300

Leu Leu Ala Pro Leu Arg Glu Trp Glu Val Gln Gly Ser Arg Arg
 3305 3310 3315

Tyr Leu Tyr Ala Ser Ala Gly Gly Leu Tyr Pro Val Gln Leu Tyr
 3320 3325 3330

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Leu His Leu Lys Pro Gly Arg Ala Arg Gly Leu Glu Pro Gly Thr
 3335 3340 3345

Trp Tyr Tyr Asp Pro Ser Thr His Arg Leu Val Leu Leu Ser Ala
3350 3355 3360

Gly Ala Gly Leu Asp Arg Arg Ile His Asp Pro His Gln Asn Gln
3365 3370 3375

Ala Ile Phe Asp Ser Ala Ala Phe Ser Leu Phe Leu Ile Ala Arg
3380 3385 3390

Met Gly Ala Val Glu Pro Val Tyr Ala Glu His Ala Leu His Phe
3395 3400 3405

Ala Thr Leu Glu Ala Gly Leu Met Thr Gln Leu Leu Asp Leu Gly
3410 3415 3420

Ala Ala Pro Ser Gly Leu Gly Leu Cys His Ile Gly Asp Leu Asp
3425 3430 3435

Phe Ala Gln Ala Arg Gly Leu Phe His Leu Glu Glu Glu His Val
3440 3445 3450

Leu Leu His Ser Leu Val Gly Gly Val Leu Pro Thr Arg Gly Gln
3455 3460 3465

Glu Ala Ala Ser Val Pro Ala Glu Gly Gly Thr Glu Ala Arg Gln
3470 3475 3480

Leu Ala Gln Leu Leu Gln Gln Val Lys Thr Leu Thr Pro Glu Ala
3485 3490 3495

Ala Arg Ala Leu Leu Glu Ala Arg Arg Gly Ser Lys Gly Arg Pro
3500 3505 3510

His Glu
3515

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<211> 2837

<212> PRT

<213> Angiococcus disciformis

<400> 13

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 Ala Gly Arg Phe Pro Gln Ala Pro Thr Leu Glu Asp Tyr Trp Arg Ile
 20 25 30
 Ile His Glu Gly Val Asp Ala Phe Thr Gln Leu Thr Asp Glu Gln Leu
 35 40 45
 Leu Ala Ser Gly Val Gly Pro Ser Leu Leu Arg Gln Pro Gly Tyr Val
 50 55 60
 Arg Arg Ala Ala Leu Leu Asp Arg Met Asp Gln Phe Asp Ala Ala Phe
 65 70 75 80
 Phe Gly Phe Ser Pro Arg Glu Ala Glu Val Leu Asp Pro Gln His Arg
 85 90 95
 Leu Phe Leu Glu Cys Ala His Glu Ala Leu Glu Arg Ala Gly His Gly
 100 105 110
 Ser Glu Arg Ala Arg Gly Arg Val Gly Val Phe Ala Ser Ala Ser Leu
 115 120 125
 Asn Ser Tyr Tyr Leu His Ser Leu His Gly Asn Ala Arg Leu Arg Glu
 130 135 140
 Val Leu Gly Asp Phe Gln Leu Ala Ile Ala Asn Asp Lys Asp Phe Leu
 145 150 155 160
 Pro Thr Arg Val Ser Tyr Lys Leu Gly Leu Arg Gly Pro Ser Val Ala
 165 170 175
 Val Gln Thr Ala Cys Ser Ser Ser Leu Val Ala Val His Leu Ala Cys
 180 185 190
 Gln Ser Leu Leu Asn Gly Glu Cys Ala Leu Ala Leu Ala Gly Gly Ser
 195 200 205
 Ser Leu Ser Val Pro Gln Ala Gln Gly Tyr Leu Tyr Gln Glu Gly Gly
 210 215 220
 Ile Ala Ser Pro Asp Gly Tyr Cys Arg Pro Phe Asp Ala Ala Ala Ala
 225 230 235 240
 Gly Thr Asn Arg Gly Asn Gly Val Gly Val Val Leu Leu Lys Leu Leu
 245 250 255

Glu Glu Ala Leu Ala Asp Gly Asp Thr Ile His Ala Val Ile Arg Gly
260 265 270

Ser Ala Val Asn Asn Asp Gly Ala His Lys Ile Gly Tyr Thr Ala Pro
275 280 285

Ser Val Glu Gly Gln Ala Ser Val Ile Ser Glu Ala Leu Glu Val Ala
290 295 300

Ala Val Ser Ala Asp Ser Ile Gly Tyr Val Glu Ala His Gly Thr Ala
305 310 315 320

Thr Ala Leu Gly Asp Pro Ile Glu Val Gln Ala Leu Thr Arg Ala Phe
325 330 335

Arg Lys His Thr Glu Arg Arg Gly Tyr Cys Ala Leu Gly Ser Val Lys
340 345 350

Ala Asn Ile Gly His Leu Asp Ala Ala Ala Gly Ile Ala Ser Leu Ile
355 360 365

Lys Ala Val Leu Val Leu Glu Arg Arg Gln Leu Pro Pro Cys Pro His
370 375 380

Phe Thr Ser Pro Asn Pro Arg Ile Asp Phe Glu Arg Ser Pro Phe Tyr
385 390 395 400

Val Ser Gly Arg Gly Gln Pro Trp Glu Pro Val Asp Gly Pro Arg Arg
405 410 415

Ala Gly Val Ser Ser Phe Gly Ile Gly Gly Thr Asn Val His Val Val
420 425 430

Leu Glu Glu Ala Pro Pro Arg Pro Ala Pro Arg Arg Ala Ala Arg Pro
435 440 445

Tyr Gln Leu Leu Pro Leu Ser Ala Arg Thr Glu Arg Ala Arg Glu Glu
450 455 460

Val Glu Ala Arg Leu Arg Glu His Leu Arg Gln Gln Pro Gln Glu Pro
465 470 475 480

Leu Glu Glu Val Ala His Thr Leu Gln Val Gly Arg Arg His Met Ala
485 490 495

Trp Arg Thr Ala Leu Val Ser Ser Ser Pro Ala Gln Ala Val Glu Leu

500

505

510

Leu Glu Arg Arg Arg Pro Glu Ala Leu Leu Arg Gly Gln Ser Ala Ala
515 520 525

Gln Ala Arg Ser Val Ala Phe Leu Leu Pro Gly Gln Gly Ser Gln Tyr
530 535 540

Val Gly Met Gly Ala Ala Leu His Glu Ser Glu Ala Pro Phe Arg Glu
545 550 555 560

Gln Val Asp Leu Cys Ala Gly Lys Leu Gln Gly Val Leu Gly Leu Asp
565 570 575

Val Arg Arg Leu Leu Tyr Pro Gly Pro Arg Glu Arg Glu Trp Ala Gln
580 585 590

Glu Arg Leu Arg Glu Thr Arg Val Cys Gln Pro Val Leu Phe Thr Val
595 600 605

Glu Tyr Ala Leu Ala Arg Leu Leu Glu Ala Trp Gly Ile Arg Pro Thr
610 615 620

Ala Leu Leu Gly His Ser Leu Gly Glu Tyr Val Ala Ala Cys Leu Ala
625 630 635 640

Gly Val Phe Ser Leu Glu Glu Ala Leu Glu Val Val Ala Ala Arg Gly
645 650 655

Gln Leu Met Gly Ser Met Pro Pro Gly Gly Met Leu Ala Val Gly Leu
660 665 670

Pro Ala Gln Glu Val Glu Pro Leu Leu Pro Ala Ala Leu Ala Leu Ala
675 680 685

Ala His Asn Ser Pro Gln Ala Cys Val Val Ala Gly Pro Thr Glu Pro
690 695 700

Leu Ala Glu Leu Arg Ala Arg Leu Glu Gln Arg Gly Ile Ala Cys Thr
705 710 715 720

Pro Leu Ala Val Ser His Ala Phe His Ser Pro Met Met Glu Pro Ala
725 730 735

Val Ala Pro Phe Val Ala Arg Leu Arg Arg Met His Leu Arg Pro Pro
740 745 750

Ser Leu Pro Phe Ile Ser Asn Val Thr Gly Thr Trp Ile Glu Ala Glu
755 760 765

Glu Ala Thr Ser Pro Glu Tyr Trp Gly Arg His Leu Leu Gln Pro Val
770 775 780

Arg Phe Ala Gln Gly Leu Glu Arg Leu Cys Glu Gly Val Gln Pro Arg
785 790 795 800

Leu Leu Leu Glu Val Gly Pro Gly His Thr Leu Gly Arg Leu Ala Ala
805 810 815

Arg Gln Ser Ser Gly Pro Val Gln Val Val Ser Thr Leu Gly Ser Ser
820 825 830

Arg Glu Glu Ser Ser Glu Val Glu Arg Leu Leu Thr Ala Ile Gly Arg
835 840 845

Leu Trp Val Glu Gly Ala Glu Val Asp Trp Ala Gly Leu His Arg Gly
850 855 860

Glu Arg Arg Arg Arg Ala Val Leu Pro Thr Tyr Pro Phe Glu His Gln
865 870 875 880

Arg Tyr Trp Val Glu Thr Ala Pro Gln Pro Ser Pro Pro Glu Arg Pro
885 890 895

Gly Thr Pro Ala Glu Ser Pro Val Thr Ser Ser Phe Tyr Val Pro Gly
900 905 910

Trp Ser Arg Ala Ala Leu Pro Ser Ala Ala Pro Ser Arg Arg Val Gly
915 920 925

Arg Leu Leu Leu Leu Ala Glu Ala His Gly Trp Ser Gln Gly Leu Ala
930 935 940

Glu Arg Leu Arg Ala Arg Gly His Ser Val Thr Leu Val Glu Pro Gly
945 950 955 960

Glu Arg Leu Glu Arg Leu Thr Pro Glu His Trp Arg Leu Pro Pro Gly
965 970 975

Arg Arg Glu Asp Phe Gln Arg Leu Leu Glu Asp Ser Gly Glu Leu Pro
980 985 990

Ser Arg Val Leu His Leu Trp Leu Leu Gly Ser Ser Gln Ser Pro Gln
995 1000 1005

Glu Arg 1010	Gly Phe Tyr Thr	Leu 1015	Leu Ala Leu Ala	Gln 1020	Ala Leu Gly
Ala His 1025	Gly Thr Arg Pro	Ala 1030	Val Glu Leu Thr	Val 1035	Val Thr Asp
Gln Leu 1040	Tyr Ala Val Ala	Glu 1045	Gly Glu Pro Ile	Gln 1050	Pro Leu Lys
Ala Leu 1055	Leu Gln Gly Pro	Ala 1060	Ser Val Leu Pro	Gln 1065	Glu Leu Pro
Gly Cys 1070	Thr Cys Arg Leu	Val 1075	Asp Met Ala Leu	Pro 1080	Pro Gly Gly
Val Ala 1085	Glu Glu Leu Leu	Glu 1090	Arg Leu Val Ala	Glu 1095	Val Glu Ser
Thr Ala 1100	Ser Glu Arg Ser	Val 1105	Ala Tyr Arg Gly	Ala 1110	Ala Arg Trp
Val Arg 1115	Glu Phe Val Pro	Val 1120	Pro Leu Pro Pro	Pro 1125	Glu Pro Ser
Gln Leu 1130	Pro Leu Arg Gln	Arg 1135	Gly Val Tyr Leu	Ile 1140	Val Gly Gly
Leu Gly 1145	Gly Val Gly Leu	Ala 1150	Leu Ala Glu His	Leu 1155	Ala Arg Arg
Val Ser 1160	Ala Arg Leu Val	Leu 1165	Thr Gly Arg Ser	Pro 1170	Thr Pro Pro
Arg Glu 1175	Ser Trp Ser Ala	Trp 1180	Leu Gly Thr Pro	Thr 1185	Arg Leu Arg
Leu Ser 1190	Gln Glu Leu Glu	Trp 1195	Leu Arg Gly Ala	Ala 1200	Glu Gln Ile
Glu His 1205	Gln Arg Pro Leu	His 1210	Ser Leu Ala Asp	Ser 1215	Pro Gly Leu
Glu Glu 1220	Ser Leu Arg Leu	Leu 1225	Cys Ala Ser Tyr	Leu 1230	Tyr His Phe
Leu Phe 1235	Pro Leu Gln Ala	Pro 1240	Leu Arg Leu Gly	Glu 1245	Pro Arg Ala

Met Gln Ala Leu Arg Glu Arg Leu Gly Leu Gln Pro Gly Phe Glu
 1250 1255 1260
 Arg Leu Phe Ser Phe Met Ile Gly Thr Leu Glu Gln Ala Lys Leu
 1265 1270 1275
 Ile Arg Val Gly Glu Gly Met Leu Glu Gly Gln Val Glu Pro Ala
 1280 1285 1290
 His Val Pro Thr Pro Arg Ala Leu His Glu Arg Leu Leu Glu Gly
 1295 1300 1305
 Tyr Pro Glu Val Ser Gly Leu Leu Glu Leu Leu Glu His Cys Val
 1310 1315 1320
 Arg His Tyr Pro Glu Val Leu Arg Gly Ser Leu Pro Ala Leu Ser
 1325 1330 1335
 Val Leu Tyr Pro Ser Gly Arg Ser Glu Glu Asp Ser Ala Arg Ser
 1340 1345 1350
 Gly Val Glu Trp Ser Ser Met Gly Gln Cys Val Ala Leu Leu Arg
 1355 1360 1365
 His Phe Leu Ala Arg His Ala Glu Arg Thr Gln Gly Arg Thr Leu
 1370 1375 1380
 Arg Ile Leu Glu Val Gly Gly Gly Ser Gly Val Val Leu Gln Ala
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 Leu Leu Pro Leu Leu Arg His His Pro Val Glu Tyr His Phe Thr
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 Asp Ile Gly Pro Ser Phe Val Arg Ala Met Glu Gly Val Gly Arg
 1415 1420 1425
 Arg Gln Gly Leu Thr Phe Leu His Thr Ser Val Leu Asp Ile Ser
 1430 1435 1440
 Arg Pro Pro Pro Glu Gln Gly His Pro Pro Gly Ser Tyr Asp Leu
 1445 1450 1455
 Val Ile Ala Leu Asn Val Val His Ala Thr Pro Arg Val Pro Gln
 1460 1465 1470
 Ser Leu Ala His Leu Glu Ser Leu Leu Val Pro Gly Gly His Leu

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Cys Leu Val Glu Thr Val	Lys Gln Gln Pro Trp Val	Asp Met Ile		
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Trp Gly Leu Ala Glu Gly	Trp Trp Ser Tyr Glu Asp	Glu Leu Arg		
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Thr Arg Ser Pro Leu Leu	Glu Val Gly Asp Trp Glu	His Ala Leu		
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Arg Asp Val Gly Phe Ala	Glu Val Glu Val Leu Pro	Ala Ala Val		
1535	1540	1545		
Glu Gln Arg Ser Arg Trp	Asp Asn Val Leu Leu Ile	Ala Gln Arg		
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Pro Gly Glu Ser Gly Leu	Gln Pro Val Gly Gly Arg	Ala Ala Met		
1565	1570	1575		
Gln Glu Arg Ile Arg Arg	Leu Arg Ala Ile Glu Glu	Ala Gly Gly		
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Glu Val Leu Pro Leu Val	Ala Asp Val Thr Asp Arg	Glu Arg Met		
1595	1600	1605		
Gly Glu Val Leu Ala Glu	Val Lys Arg Arg His Gly	Ala Leu His		
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Gly Val Ile His Ala Ala	Leu Val Leu Glu Asp Gly	Leu Met Gln		
1625	1630	1635		
Leu Lys Thr Arg Glu Ser	Ala Gly Arg Val Leu Ala	Ser Lys Val		
1640	1645	1650		
Glu Gly Thr Leu Val Leu	Asp Glu Leu Leu Arg Asp	Glu Pro Leu		
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Asp Phe Phe Val Leu Cys	Ser Ser Leu Ser Ala Leu	Leu Gly Ala		
1670	1675	1680		
Leu Gly Gln Ala Asp Tyr	Ala Ala Ala Ser Ala Phe	Leu Asp Ala		
1685	1690	1695		
Tyr Ala His Ser Gln Arg	Gly Arg Thr Asp Arg Arg	Thr Ile Ser		
1700	1705	1710		

Met Asp Trp Asp Arg Trp Leu Glu Val Gly Ala Ala Met Arg Leu 1715 1720 1725
Gly Leu Gly Leu Ala Ala Gly Ala Leu Gly Leu Gln Arg Thr Ala 1730 1735 1740
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Leu Asp Glu His Arg Leu Glu Gly Arg Ala Thr Leu Pro Gly Val 1760 1765 1770
Ala Tyr Leu Glu Leu Val Arg Ala Ala Leu Val Gln Glu Leu Gly 1775 1780 1785
Glu Ala Pro Val Glu Leu Glu Gln Leu Val Leu Leu Ser Leu Leu 1790 1795 1800
Glu Ala Pro Ala Gly Glu Glu Val Glu Val Arg Phe His Leu Arg 1805 1810 1815
Pro Glu Asp Glu Gly Tyr Ala Leu Glu Ile Arg Ser Arg Ala Gly 1820 1825 1830
Gly Leu Ala Asn Gly Gly Trp Arg Ser His Ala Met Gly Arg Val 1835 1840 1845
Arg Met Leu Pro Arg Gly Ser Ala Arg Pro Thr His Pro Leu Arg 1850 1855 1860
Glu Leu Glu Glu Arg Leu Gly Leu Thr Gln Ala Pro Arg Glu His 1865 1870 1875
Glu Pro Ala Gln Gly Pro Arg Glu Leu Ala Pro Ala Leu Gly Arg 1880 1885 1890
Arg Trp Ser Ser Leu Ser Trp His Arg Ala Trp Lys Gly Glu Glu 1895 1900 1905
Gly Leu Ala Leu Ile Glu Leu Pro Glu Glu Leu Ala Glu Asp Leu 1910 1915 1920
Arg Gln Trp Pro Leu His Pro Ala Leu Leu Asp Ala Ala Thr Gly 1925 1930 1935
Phe Ala Pro Leu Pro Pro Gly Ala Trp Leu Pro Leu Ser Tyr Gly 1940 1945 1950

Asn Thr 1955	Arg Ile His Gly 1960	Pro Leu Pro Arg Gln Leu 1965	Tyr Ser His
Ile Arg 1970	Arg Leu Glu Pro 1975	Ala Ser Ala Gln Ala Gly 1980	Val Val Arg
Leu Glu 1985	Val Arg Leu Met 1990	Asp Gly Glu Gly Arg 1995	Leu Leu Cys
Val Glu 2000	Glu Phe Val Leu 2005	Arg Arg Val Glu Val 2010	Asp Ser Leu Ala
Arg Pro 2015	Gln Pro Ala Gly 2020	Lys Ala Pro Arg Gln 2025	Ala Val Leu Pro
Arg Pro 2030	Gly Ala Leu Asp 2035	Ser Leu Arg Leu Gln 2040	Pro Leu Glu Arg
Leu Pro 2045	Pro Gln Glu Gly 2050	Glu Val Glu Val Gln 2055	Val Leu Ala Ala
Gly Leu 2060	Asn Phe Lys Asp 2065	Ala Leu Leu Ala Leu 2070	Gly Ala Leu Pro
Val Glu 2075	Leu Ala Asn Gly 2080	Ala Pro Leu Ala Leu 2085	Gly Val Glu Cys
Ala Gly 2090	Ile Ile Ser Ala 2095	Val Gly Pro Gly Val 2100	Arg Gly Leu Arg
Val Gly 2105	Glu Ala Val Val 2110	Ala Ala Ala Gly 2115	Ala Phe Ala Ser
His Val 2120	Arg Val Pro Gln 2125	Glu Gln Val Phe Pro 2130	Lys Pro Ala Gly
Leu Ser 2135	Phe Glu Gln Ala 2140	Ala Met Val Pro Val 2145	Thr Leu Phe Thr
Ala Trp 2150	Tyr Ala Leu Glu 2155	Glu Leu Ala Arg Leu 2160	Arg Ala Gly Glu
His Val 2165	Leu Ile His Ala 2170	Ala Ala Thr Gly Val 2175	Gly Leu Ala Gly
Val Lys 2180	Leu Ala Leu Arg 2185	Arg Gly Ala Thr Val 2190	Tyr Ala Thr Ala

Gly Ser Glu Pro Lys Arg Glu Leu Leu Arg Ser Leu Gly Val Thr
 2195 2200 2205
 Leu Ala Met Asp Ser Arg Ala Pro Gly Phe Asp Asp Gln Leu Leu
 2210 2215 2220
 Gln His Thr Gln Gly Arg Gly Val Asp Val Val Leu Asn Ser Leu
 2225 2230 2235
 Ser Gly Glu Phe Leu Ser Arg Ser Leu Gly Val Leu Ala Arg His
 2240 2245 2250
 Gly Arg Phe Val Glu Leu Gly Val Arg Asp Met Leu Ser Gly Gly
 2255 2260 2265
 Thr Leu Pro Leu Ala Pro Phe Glu Arg Gly Leu Thr Phe Leu Ala
 2270 2275 2280
 Ala Gln Ile Asp Pro Gly Met Lys Gly Tyr Arg Glu Leu Met Gly
 2285 2290 2295
 Glu Ala Leu Arg Gln Ile Glu Arg Gly Glu Leu Glu Pro Leu Pro
 2300 2305 2310
 Tyr Thr Ala Trp Pro Leu Glu Arg Val Ala Glu Ala Leu Gln Leu
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 Val Ser Lys Gly Arg His Val Gly Lys Val Val Leu Thr Pro Glu
 2330 2335 2340
 Glu Pro Leu Ser Arg Pro Pro Ala Leu Pro Ser Ser Ser Arg Pro
 2345 2350 2355
 Val Gln Pro Arg Ala Gly Val Ala Ile Val Gly Leu Arg Ser Ala
 2360 2365 2370
 Glu Gly Cys Glu Ala Phe Glu Arg Ile Leu Ala Ala Gly Leu Pro
 2375 2380 2385
 Gln Val Ala Val Ser Thr Arg Glu Leu Arg Ala Arg Met Ala Glu
 2390 2395 2400
 Ile Glu Arg Leu Arg Val Ser Ser Trp Glu Pro Ala Leu Pro Ser
 2405 2410 2415
 Val Pro Arg Gly Ser Pro Ala Arg Thr Glu Arg Ser Lys Pro Tyr

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Val Ala Pro Arg Thr Glu Arg Glu Arg Ala Leu Ala Ala Leu Trp				
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Gln Asp Leu Leu Gly Val Ser Glu Val Gly Leu Asp Asp Asp Phe				
2450		2455		2460
Phe Glu Leu Lys Gly Asp Ser Leu Leu Ala Ile Gln Leu Met Gly				
2465		2470		2475
Arg Leu Arg Lys Glu Leu Glu Val Glu Leu Pro Leu Ser Ser Phe				
2480		2485		2490
Leu Ala Arg Pro Thr Leu Arg Thr Leu Leu Ser Ala Met Pro Ala				
2495		2500		2505
Pro Ala Thr Asp Glu Pro Ala Ser Ala Thr Gly Ala Ile Pro Ala				
2510		2515		2520
Ala Ala Pro Gln Pro Ser Pro Ala Val Ser Ser Glu Pro Ala Arg				
2525		2530		2535
Lys Trp Arg His Leu Val Pro Ile Gln Pro Gln Gly Glu Ser Pro				
2540		2545		2550
Pro Phe Phe Trp Ala Ala Pro Leu Met Gly Thr Val Phe Pro Tyr				
2555		2560		2565
Phe Thr Leu Ala Arg Cys Leu Ala Pro Thr His Pro Phe Tyr Ala				
2570		2575		2580
Leu Gln Pro Pro Gly Leu Gln Glu Gly Gln Glu Pro Met Asp Lys				
2585		2590		2595
Val Glu Glu Leu Ala Ala Leu Tyr Val Arg Glu Leu Arg Glu Leu				
2600		2605		2610
Gln Pro Arg Gly Pro Tyr Arg Leu Gly Gly Trp Ser Phe Gly Cys				
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Val Val Ala Tyr Glu Val Ala Leu Gln Leu Glu Ala Ala Gly Glu				
2630		2635		2640
Gln Val Ala Leu Leu Ser Leu Leu Asp Phe Pro Ala Pro Ser Gly				
2645		2650		2655

Gln Arg Ala Ser Leu Trp Ala Thr Ala Arg Phe Phe Ser Gly Ser
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Val Leu Arg Gly Leu Ala Pro Tyr Thr Leu Asp Tyr Leu Tyr Leu
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Ala Ala Arg Ala Pro Leu Asn Pro Asp Ala Ala Ser Arg Leu Ser
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Ser Ser Leu Thr Arg Gly Trp Glu Arg Leu Arg Lys Gly Gly Leu
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Val Gln Glu Leu Leu Asp His Ala Ala Met Ala Arg Val Val Pro
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Glu Asp Ser Arg Leu Leu Leu Leu Arg Glu Pro Gly Ile Ala Pro
2735 2740 2745

Met Leu Arg Leu Thr Arg Ala His Gln Arg Ala Met Leu Ser Tyr
2750 2755 2760

Arg Pro Arg Gly Arg Leu Arg Gln Arg Ile Val Leu Phe Arg Thr
2765 2770 2775

Ser Glu Gln Ala Trp Ser Phe Ala Arg Asp Leu Gly Trp Gly Ala
2780 2785 2790

Leu Ser Ala Ser Gly Val Asp Val Arg Glu Ala Pro Gly Asp His
2795 2800 2805

Met Thr Leu Leu Arg Pro Pro His Val Glu Arg Val Ala Glu Gln
2810 2815 2820

Leu Arg Ala Leu Leu Ser Ser Ala Pro Leu Pro Thr Arg Arg
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<211> 385

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<213> Angiococcus disciformis

<400> 14

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Phe Glu His Asn Gln Thr Val Ser Arg Val Tyr Gln Asp Asn Asp Val
 35 40 45

Ala Val Tyr Phe Asp Ser Ala Val Asn Arg Ser Ile Thr Trp Pro Asn
 50 55 60

Thr Tyr Leu Gly Asp Val Trp Arg Tyr Thr Lys Arg Thr Tyr Gly His
 65 70 75 80

Phe Gly Thr Asp Ser Gln Leu Tyr Thr Ile Phe His Ala Gly Lys Tyr
 85 90 95

Ser Gly Gly His Pro Ser Thr Tyr Phe Asp Ala Ser His Asp Arg Arg
 100 105 110

Asn Val Ile Asp Val Gly Ser Ser Ser Pro Thr Ala Trp Thr Ala Gly
 115 120 125

Thr Gly Asn Asp Leu Asp Ile Val Thr His Glu Val Ala His Ile Val
 130 135 140

Glu Leu Ala Ser Lys Gly Val His Asp Ser Pro Ala Phe Gly Leu Trp
 145 150 155 160

Arg Asp Ser Lys Trp Ala Glu Ile Phe Asn Tyr Asp Val Tyr Leu Ala
 165 170 175

Leu Gly Arg Thr Ser Asp Ala Asn Arg Trp Tyr Asn Leu Met Val Asn
 180 185 190

Thr Thr Asp Ser Phe Pro Arg Ala Asn Thr His Trp Phe Arg Asp Trp
 195 200 205

Phe Tyr Pro Ile Tyr Lys Asn His Gly Gly Ser Ser Val Leu Asn Arg
 210 215 220

Tyr Phe Val Leu Leu Ala Gln Tyr Leu Pro Lys Asn Gly Ser Asn Tyr
 225 230 235 240

Ala Arg Ser Leu Asn Trp Gly Glu Phe Ile His Phe Trp Ser Gly Ala
 245 250 255

Ala Gly Val Asn Leu Lys Thr Leu Ala Thr Ser Ala Phe Gly Trp Pro
 260 265 270

Ala Glu Trp Glu Ala Gln Phe Thr Gln Ala Gln Arg Asp Phe Pro Phe
 275 280 285

Thr Tyr Thr Pro Pro Gly Pro Thr Ala Val Thr Val Phe Gln Asp Gln
 290 295 300

Asn Tyr Gly Gly Tyr Gly Met Ala Leu Pro Val Gly Arg Tyr Thr Leu
 305 310 315 320

Ser Ala Leu His Ala Trp Gly Val Arg Asn Asp Asp Ile Thr Ser Leu
 325 330 335

Lys Val Ala Ser Gly Tyr Lys Val Thr Leu Tyr Glu His Asp Asn Phe
 340 345 350

Ser Gly Ala Ser Leu Thr Lys Thr Ala Asp Asp Ala Ser Leu Val Asp
 355 360 365

Asp Ser Trp Asn Asp Lys Met Ser Ser Leu Ile Val Ser Ala Ser Gly
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Met
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<210> 15

<211> 252

<212> PRT

<213> *Angiococcus disciformis*

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Thr Pro Leu Ala Ala Leu His Arg Ala His Leu Glu Ala Val Pro Phe
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Glu Asn Leu Asp Ile His Leu Lys Arg Pro Ile Arg Leu Asp Glu Ala
 35 40 45

Ala Phe Phe Glu Lys Val Val Leu Gln Arg Arg Gly Gly Phe Cys Tyr
 50 55 60

Glu Leu Asn Gly Leu Phe Ala Arg Leu Leu Arg Thr Leu Gly Tyr Arg

132

65

70

75

80

Val Thr Leu Leu Ser Ala Arg Val Ala Ser Arg Pro Asp Gly Ser Ala
 85 90 95

Tyr Gly Pro Asp Phe Asp His Leu Ala Leu Leu Val Glu Asp Ala Ser
 100 105 110

Gly Arg Trp Leu Ala Asp Val Gly Phe Gly Glu Cys Phe Leu Glu Pro
 115 120 125

Leu Arg Leu Asp Glu Arg Gly Val Gln Thr Gln Asp Gly Arg Gly His
 130 135 140

Arg Leu Val Glu Asp Ala Glu Gly Leu Val Val Trp Arg Glu Ala Ala
 145 150 155 160

Ser Gly Asp Trp Lys Ala Gln Tyr Val Val Ser Leu Ile Pro Arg Glu
 165 170 175

Leu Gly Asp Phe Ala Ala Met Cys His His Gln Gln Thr Ser Pro Glu
 180 185 190

Ser His Phe Thr Gln Arg Arg Leu Cys Thr Arg Thr Thr Pro Asp Gly
 195 200 205

Arg Ile Thr Leu Lys Glu Gly Ala Leu Val Val Thr Ser Gly Gly Ala
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Arg His Glu Gln Arg Leu Pro Asp Glu Ala Ala Trp Arg Ala Ala Leu
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Thr Arg His Phe Gly Ile Thr Leu Pro Ser Gly Gly
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<210> 16

<211> 308

<212> PRT

<213> Angiococcus disciformis

<400> 16

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Tyr Thr Val Lys Ser Gly Asp Thr Phe Ser Gly Ile Ala Ala Lys His
35 40 45

Glu Leu Ser Leu Ala Ala Leu Lys Lys Leu Asn Pro Gln Val Glu Asn
50 55 60

Ile Asn Val Ile His Pro Gly Gln Lys Leu His Val Lys Val Val Asn
65 70 75 80

Ala Pro Ala Pro Glu Pro Lys Pro Thr Pro Lys Pro Pro Thr Asn Lys
85 90 95

Asn Thr Ser Val Leu Pro Lys Gly Ile Pro Asn Thr Glu Gly Met Ser
100 105 110

Gln Ala Lys Glu Tyr Ala Leu Tyr Ser Lys Tyr Val Glu Lys Tyr Gly
115 120 125

Asp Ala Lys Ala Lys Gln Asp Leu Ala Ala Gly Lys Arg Val Ile Val
130 135 140

Gly Leu Arg Val Asn Thr Pro Phe Thr Arg Asp Arg Pro Ser Gly Gly
145 150 155 160

Ser Tyr Asp Asp Arg Leu Val Val Met Trp Lys Asp Ser Ser Gly Lys
165 170 175

Pro His Val Gln Glu Phe Lys Ala Asn Thr Glu Pro Asn Arg Arg Trp
180 185 190

Ala Asp Asp Pro Ser Gln Ser Thr Lys Pro Val Gly Arg Leu Val Gly
195 200 205

Asn Lys Thr Tyr His Tyr Arg Lys Ser Phe Asn Gly Asn Phe Gly Gly
210 215 220

Asn Ile Leu Ala Pro Asp Leu Arg Tyr Gly Asn Pro Thr Val Arg Arg
225 230 235 240

Asp Thr Asn Arg Asp His Arg Ile Asn Ser Lys Asp Asp Val Phe Ser
245 250 255

Gly Asp Trp Gly Gly Gln Gly Tyr Tyr Phe His Arg Gly Gly Thr Thr
260 265 270

Asp Thr Tyr Ser Ala Gly Cys Gln Thr Met Asp Gln Gly Arg Phe Asn
 275 280 285

Asn Phe Trp Ala Ala Leu Gly Ser Gln Ser Glu Phe Ser Tyr Val Leu
 290 295 300

Ala Gln Val Gly
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<210> 17

<211> 293

<212> PRT

<213> Angiococcus disciformis

<400> 17

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 20 25 30

Ala Leu Val Ala Glu Asn Ala Arg Leu Lys Gly Glu Asp Ala Gln Ala
 35 40 45

His Leu His His Ala Asp Glu Thr His Trp Leu Leu Leu Asp Lys Gly
 50 55 60

Pro Gly Thr Lys Trp Tyr Ala Trp Thr Val Ala Ser Pro Asp Thr Val
 65 70 75 80

Phe His Arg Ile Tyr Pro Ser Arg Ser Gly Ala Thr Ala Arg Thr Val
 85 90 95

Leu Gly Asp Tyr Glu Gly Val Val Leu Val Asp Gly Tyr Ala Ala Tyr
 100 105 110

Gln Thr Ala Thr Lys Ser Ser Ala Asp Gly Pro Cys Pro Ala Thr Leu
 115 120 125

Ala Phe Cys Trp Ala His Val Arg Arg Lys Phe Phe Glu Ala Gln Gln
 130 135 140

Phe Ala Pro Ala Cys Lys Glu Val Leu Asp Leu Ile Gly Glu Leu Tyr
 145 150 155 160

Ala Val Glu Ala Asp Leu Pro Gly Trp Tyr Ala Leu Glu Gly Glu Glu
 165 170 175

Arg Gln Ala Ala Leu Ala His Arg Leu Ala Val Arg Gln Gln Lys Ser
 180 185 190

Ala Pro Leu Thr Glu Arg Ile Arg Asp Trp Ala His Ala Gln Arg Ala
 195 200 205

Leu Pro Gly Ser Ala Phe Arg Lys Ala Leu Glu Tyr Met Leu Asn Leu
 210 215 220

Trp Ala Gly Leu Thr Val Phe Leu Thr Gln Pro Gln Val Pro Leu Asp
 225 230 235 240

Asn Asn His Val Glu Arg Gln Leu Arg Asp Met Val Ile Gly Arg Lys
 245 250 255

Asn Leu Lys Thr Ala Arg Leu Arg Gly Glu Ala Pro Gly His Tyr Leu
 260 265 270

Arg Arg Pro Ala Leu Ala Ala Ile Glu Asn Pro Gly Thr Val Thr Leu
 275 280 285

Pro Lys Ala Gln Ser
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Val Gly Arg Gly Leu Gln Pro Leu Pro Pro Asp Ala Pro																	
1 5 10																	
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His Pro Arg Pro Ala Arg Cys Glu Gly Arg Arg Trp Gln Gly Leu Gly																	
15 20 25																	
gca cat ggt cag ccg cac cta cgg cct cga aga ggt gaa tca ggc cct																	206
Ala His Gly Gln Pro His Leu Arg Pro Arg Arg Gly Glu Ser Gly Pro																	
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Gly Arg Cys Arg Asp Gly Ser His Arg Glu Gly Thr His Pro Pro Gln																	
50 55 60																	
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Ser Arg Ser Tyr Leu Ala Met Thr Ala Asp Ser Met Asp Ala Thr Val																	
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Pro Ser Arg Arg Pro Ala Leu Gly Phe Ile Gly Gly Gly Val Met Ala																	
80 85 90																	
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Glu Ala Leu Ile Gly Ala Val Thr Gly Gly Gly Leu Ala Ala Pro Gly																	
95 100 105																	
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Thr Leu Leu Val Gly Glu Val Asp Glu Glu Arg Arg Arg Val Leu Arg																	
110 115 120 125																	
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Ile Ile Ala Gly Ala Arg Leu Gln Thr Leu Cys Glu Gly Leu Glu His																	
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Pro Leu Val Val Arg Ala Met Pro Asn Thr Pro Ala Arg Val Arg Lys																	
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Ala Ala Thr Phe Trp Ile Pro Ser Ala Gly Leu Ser Glu Pro Ala Leu																	
210 215 220																	
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Val Arg Val Arg Ser Leu Leu Gly Ala Leu Gly Thr Glu Val Glu Val																	
225 230 235																	

139

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Ala Asp Glu Ala Gly Val Glu Met Ala Thr Gly Leu Ala Gly Pro Met	
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Pro Ala Phe Val Tyr Phe Leu Ile Glu Ala Phe Ile Asp Ala Gly Val	
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Ala Leu Gly Leu Pro Arg Asp Gln Ala Thr Leu Ala Thr Val Glu Ser	
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Met Arg Gly Ser Leu Glu Leu Leu His Arg Ser Gln Glu Ser Pro Ala	
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Ala Leu Arg Lys Gln Val Thr Ser Pro Gly Gly Ala Thr Leu Ala Gly	
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Leu Lys Val Phe Glu Ser Ala Gly Val Arg Asp Ala Met Asp Ala Ala	
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Val Arg Ala Val His Ala Arg Ala Gln Glu Leu Gly Arg Leu Pro Leu	
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Ala Pro Leu Glu Pro Gly Lys Glu Gly	
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Leu Arg Trp Asn Tyr Ser Asn Ala Gly Tyr Val Leu Leu Gly Leu Leu	
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Val Phe Lys Pro Thr Arg Met Lys Thr Ala Arg Gly Ile Ser Glu Ala	
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Thr Arg Asn Val Thr Val Ser Ala Met Leu Asp Pro Ala Leu Gly Ser	
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Leu Gly His Phe Arg Ser Pro Gln Ala Thr Gly Ser Gly Val Val Thr	
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Glu Pro Ile Val Ala Leu Ala Arg Leu Ala Lys Ala Tyr Arg Asn Leu	
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gat ccg Asp Pro 1250	gtg gtg ccc ttc aac Val Val Pro Phe Asn 1255	ctg ggc aac agt gtg Leu Gly Asn Ser Val 1260	gag gcc cag Glu Ala Gln	10985
atc gcc Ile Ala 1265	acc ttg gat cgg gtc Thr Leu Asp Arg Val 1270	gtc aag agg cac gat Val Lys Arg His Asp 1275	ctg agc aag Leu Ser Lys	11030

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Gly Glu Ala Arg Ser			
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Glu Ala	Leu Glu	Trp Val	Asp Ser	Ser Ser	Gly Trp	Leu Pro	Lys Gly	
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Ser Gly	Glu Ala	Arg Ser						
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Ala Arg Gly Ala	Ser Met Thr Arg Ile	Leu Leu Phe Ser Gly Lys				
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Gly Gly Val Gly	Lys Thr Thr Ala Ser	Ala Ala Thr Ala Val Ala				
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Ala Ala Lys Arg	Gly Tyr Arg Thr Leu	Val Met Ser Phe Asp Ile				
	1705	1710			1715	
gcc cac agc ctc	tcg gac agc ttc gat	ctc gat cgc aag ctc ttc				47647
Ala His Ser Leu	Ser Asp Ser Phe Asp	Leu Asp Arg Lys Leu Phe				
	1720	1725			1730	
gac ttc aac gag	gga ctg ccc cag aag	gtc gcc ccc aac ctt gaa				47692
Asp Phe Asn Glu	Gly Leu Pro Gln Lys	Val Ala Pro Asn Leu Glu				
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Leu Gln Glu Ile	Asp Ile Gln His Glu	Leu Gln Arg Gln Trp Ser				
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gaa gtc tat aac	tac atg tcc gtg ctg	ctg acc tcc acc ggg gta				47782
Glu Val Tyr Asn	Tyr Met Ser Val Leu	Leu Thr Ser Thr Gly Val				
	1765	1770			1775	
tcc aac atg gtg	gcc gag gag gtc gcc	att ctc ccg ggc acg gag				47827
Ser Asn Met Val	Ala Glu Glu Val Ala	Ile Leu Pro Gly Thr Glu				
	1780	1785			1790	
gac gtc atc tcg	ctc atc tac ctg aac	cag tac gtg cag cag ggg				47872
Asp Val Ile Ser	Leu Ile Tyr Leu Asn	Gln Tyr Val Gln Gln Gly				
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Leu Lys Ile Asp	Phe Ala Arg Pro Val Asn Ala Val	
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Arg Pro Val Met Gln Leu	Lys Gly Ala Gly Ser Ala Met Arg Met	
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Thr Arg Ile Leu Gly Glu	Gln Glu Leu Arg Gln Ile Val Arg Ala	
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Thr Gly Leu His Ala Leu	Met Asp Glu Val Ile Ser Thr Leu Glu	
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Tyr Glu Leu Glu His Phe	Asp Pro Ala Asn Thr Glu Leu Arg Lys	
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Trp Met Pro Val Met Gln	Val Gly Arg His Ala Val Ile Lys Leu	
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His Asp Ile Ala Pro Glu	Ala Met Arg Ser Phe Ala Arg Arg Val	
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Ala Phe Leu Gly Leu Glu	Val Val Ala Val Pro Leu Thr Arg Val	
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Glu Gln	Glu Ala Asp Ile Leu	Cys Thr Ala Thr Ser	Val Ala Val	
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Gly Ala	Gly Pro Val Val Ser	Gly Arg Leu Ile Lys	Ala His Leu	
2300	2305	2310		
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His Ile	Asn Ala Val Gly Ser	Asp Leu Pro Gly Lys	Thr Glu Leu	
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Pro Leu	Glu Met Leu Arg Arg	Ala Leu Val Cys Pro	Asp Tyr Leu	
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Pro Gln	Ala Val Val Glu Gly	Glu Cys Gln Gln Leu	Glu Pro Gly	
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Phe Ser	Leu Glu Asp Lys Val	Val Leu Glu Val Ile	Leu Ala His	
2390	2395	2400		
gcc gag	cgg ctg ggg gta ggc	cgc ctg ctc cag gtg	gag tcc atg	49720
Ala Glu	Arg Leu Gly Val Gly	Arg Leu Leu Gln Val	Glu Ser Met	
2405	2410	2415		
gcc gag	gac ccc aag gat ccg	tat ggc ttt ctc cag	gag aca gcg	49765
Ala Glu	Asp Pro Lys Asp Pro	Tyr Gly Phe Leu Gln	Glu Thr Ala	
2420	2425	2430		
acc tgc	ctg aaa gct gcc cca	gcc gta taa cgagccaagg	tggtcga atg	49815
Thr Cys	Leu Lys Ala Ala Pro	Ala Val	Met	
2435	2440			
aga ata	ctc acg gat gta ttt	ctg cgg aag tac cag	cga gcc cct	49860
Arg Ile	Leu Thr Asp Val Phe	Leu Arg Lys Tyr Gln	Arg Ala Pro	
2445	2450	2455		
gga ccg	cgc gag cgt tcc ctg	gcc gcg gac gcg cgc	tcc aag ctg	49905
Cly Pro	Arg Glu Arg Ser Leu	Ala Ala Asp Ala Arg	Ser Lys Leu	
2460	2465	2470		
tgg ctg	tcc gtt gga ctg acc	gcc ttc ctc gtg cct	gcc tat att	49950
Trp Leu	Ser Val Gly Leu Thr	Ala Phe Leu Val Pro	Ala Tyr Ile	
2475	2480	2485		
gag cag	ctc tgc cgc atg ttg	ggg ctg ccg aag ggc	gag ctg ccc	49995
Glu Tyr	Phe Cys Arg Met Leu	Gly Leu Pro Lys Gly	Glu Leu Pro	
2490	2495	2500		
acc aag	ctc tat gac atg ctg	cgc gag cgc aat gag	gcg cca gac	50040
Trp Lys	Leu Tyr Asp Met Leu	Arg Glu Arg Asn Glu	Ala Pro Asp	

2505	2510	2515	
ctc aag caa cgc ttt cag cag ctc gag cac ctg ccc gag ggt tcc Leu Lys Gln Arg Phe Gln Gln Leu Glu His Leu Pro Glu Gly Ser 2520 2525 2530			50085
ttt ggc cgc gag ttc tgg aag tac tgc cac tcc cat ggc gtg ccg Phe Gly Arg Glu Phe Trp Lys Tyr Cys His Ser His Gly Val Pro 2535 2540 2545			50130
ctg ccg ggt cac cct cac gcc ctg ccc gtg cac tcg gcc gtg cat Leu Pro Gly His Pro His Ala Leu Pro Val His Ser Ala Val His 2550 2555 2560			50175
gac ttc gtc cac ctg ctc tcc ggc tat ggc atc tcc atc tgg gag Asp Phe Val His Leu Leu Ser Gly Tyr Gly Ile Ser Ile Trp Glu 2565 2570 2575			50220
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cgc acc cgc aac tat gat ccg gcc cag tac aag tcc ttg gtg ccc Arg Thr Arg Asn Tyr Asp Pro Ala Gln Tyr Lys Ser Leu Val Pro 2595 2600 2605			50310
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 Asn Glu Val Glu Ser Ser Arg Asn Glu Ala Glu Trp Asn Glu Leu
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 Pro Ile Ser Ala Arg Asp Cys Glu Asp Leu Lys Lys Ser Cys Leu
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Gln	Leu	Thr	Leu	Pro	Thr	Ala	Thr	Phe	Thr	Asp	His	Ile	Leu	Arg	
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Pro	Tyr	Thr	Gln	Asp	Glu	Val	Glu	Gly	Glu	Pro	Ala	Lys	Val	Lys	
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Lys	Tyr	Glu	Ala	Pro	Phe	Gly	Tyr	Ala	Pro	Gln	Ile	Phe	Asp	Thr	
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Thr	Pro	Ala	Leu	Gly	Leu	Pro	Gly	Ile	Ser	Met	Ala	His	Asp	Val	
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Pro	His	Pro	Glu	Ala	Ala	Ser	Tyr	Leu	Ala	Gln	Gly	Arg	Thr	Val	
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Phe	Val	Cys	Gly	Asp	Ala	Pro	Asp	Met	Asp	Gly	Thr	Asn	Met	Asn	
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Leu	Leu	Ala	Ala	His	His	His	Lys	Thr	Glu	Ala	Trp	Ala	Arg	Gln	
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Phe	Leu	Ile	Val	Gln	Tyr	Leu	Ala	Ser	Ala	Arg	Pro	Ala	Leu	Pro	
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Ser	Ala	Leu	Cys	Asp	Trp	Leu	Val	Glu	Gln	His	Glu	Ala	His	Gly	
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179

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Thr Cys Ile Ser Val Arg Asn Leu Gly Asn Ala Val Arg Leu Trp	
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Glu Met Ala Lys	Ala Glu Arg Val Ala	Ser Asp Val Leu Lys Asn	
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 Thr Ala Thr Val Leu Ala Arg Ala Ile Tyr Glu Glu Gly Leu Lys
 3865 3870 3875
 ctg gtg gcc gcc ggc cac agc ccc atg gac ctc aag cgc ggc atc 71035
 Leu Val Ala Ala Gly His Ser Pro Met Asp Leu Lys Arg Gly Ile
 3880 3885 3890
 gac aag gcc gtc gag gtc gtc gtg gag gag ctg aag aag ctg tcc 71080
 Asp Lys Ala Val Glu Val Val Val Glu Glu Leu Lys Lys Leu Ser
 3895 3900 3905
 aag ccc acg gcg gac aag aag gcc atc acc cag gtg ggc acc atc 71125
 Lys Pro Thr Ala Asp Lys Lys Ala Ile Thr Gln Val Gly Thr Ile
 3910 3915 3920
 tcc gcc aac ggt gat gag acc atc ggc tcc atc atc gcg gac gcg 71170

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Ser 3925	Ala Asn Gly Asp 3930	Glu Thr Ile Gly Ser 3935	Ile Ile Ala Asp Ala 3935	
atg Met 3940	gag aag gtg ggc aag Glu Lys Val Gly Lys 3945	gag ggc gtc atc acc Glu Gly Val Ile Thr 3950	gtc gag gag gcc Val Glu Glu Ala	71215
aag Lys 3955	ggc ctg gag acc aac Gly Leu Glu Thr Asn 3960	ctc gac gtg gtg gag Leu Asp Val Val Glu 3965	ggc atg cag ttc Gly Met Gln Phe	71260
gac Asp 3970	cgc ggc tac gtc tct Arg Gly Tyr Val Ser 3975	ccg tac ttc gtg acg Pro Tyr Phe Val Thr 3980	aac cgc gag cgc Asn Arg Glu Arg	71305
atg Met 3985	gag gtc gtc atg gac Glu Val Val Met Asp 3990	gac ccc ttc atc ctc Asp Pro Phe Ile Leu 3995	atc agc gag aag Ile Ser Glu Lys	71350
aag Lys 4000	gtc tcg tcg atg cag Val Ser Ser Met Gln 4005	gac atg att ccc atc Asp Met Ile Pro Ile 4010	ctg gag cag gtg Leu Glu Gln Val	71395
gcg Ala 4015	cgc tcc ggg aag ccg Arg Ser Gly Lys Pro 4020	ctg ctc atc atc gcc Leu Leu Ile Ile Ala 4025	gac gac atc gag Asp Asp Ile Glu	71440
ggc Gly 4030	gag gcg ctg gcc acc Glu Ala Leu Ala Thr 4035	ctg gtg gtc aac aag Leu Val Val Asn Lys 4040	atc cgc ggc gtg Ile Arg Gly Val	71485
ctg Leu 4045	aac gtg gcc gcg gtg Asn Val Ala Ala Val 4050	aag gcg ccg ggc ttc Lys Ala Pro Gly Phe 4055	ggt gac cgc cgc Gly Asp Arg Arg	71530
aag Lys 4060	gag atg ctg aag gac Glu Met Leu Lys Asp 4065	atc gcc acc ctg acg Ile Ala Thr Leu Thr 4070	ggc ggc atg gtc Gly Gly Met Val	71575
gtc Val 4075	agc gag gag ctg ggc Ser Glu Glu Leu Gly 4080	cac aag tac gag aac His Lys Tyr Glu Asn 4085	ctg acg ctc aac Leu Thr Leu Asn	71620
gac Asp 4090	ctg ggc cgc tcc aag Leu Gly Arg Ser Lys 4095	cgc atc acg gtg gac Arg Ile Thr Val Asp 4100	aag gac aac acc Lys Asp Asn Thr	71665
acc Thr 4105	atc gtc gac ggc gcc Ile Val Asp Gly Ala 4110	ggc acc aag agc gag Gly Thr Lys Ser Glu 4115	atc gag ggc cgc Ile Glu Gly Arg	71710
atc Ile 4120	aag ctc atc cgc tcg Lys Leu Ile Arg Ser 4125	cag atc gac acc gtc Gln Ile Asp Thr Val 4130	acc agc gac tac Thr Ser Asp Tyr	71755
gac Asp 4135	cgc gag aag ctc cag Arg Glu Lys Leu Gln 4140	gag cgg ctg gcc aag Glu Arg Leu Ala Lys 4145	ctg gtg ggc ggc Leu Val Gly Gly	71800
gtg Val 4150	gcc gtc atc aac gtg Ala Val Ile Asn Val 4155	ggc gcc gcg acc gag Gly Ala Ala Thr Glu 4160	acc gag atg aag Thr Glu Met Lys	71845

gag aag aag gcc cgc gtg gag gac gcg ctg cat gcg act cgc gcg 71890
Glu Lys Lys Ala Arg Val Glu Asp Ala Leu His Ala Thr Arg Ala
4165 4170 4175

gcc gtc gag gag ggc atc gtc cct ggc ggc ggc gtg gcc ttc ctg 71935
Ala Val Glu Glu Gly Ile Val Pro Gly Gly Gly Val Ala Phe Leu
4180 4185 4190

cgc tgc ctg ccc gcg ctg gag aag ctg aag ctg ggc ggt gag cag 71980
Arg Cys Leu Pro Ala Leu Glu Lys Leu Lys Leu Gly Gly Glu Gln
4195 4200 4205

gac ttc ggc gtg gag atc atc cgc cgc gcg ctc cag gag ccg ctg 72025
Asp Phe Gly Val Glu Ile Ile Arg Arg Ala Leu Gln Glu Pro Leu
4210 4215 4220

cgg aag atc gcc tcc aac gcc ggc gtc gag ggc gcg gtg gtc atc 72070
Arg Lys Ile Ala Ser Asn Ala Gly Val Glu Gly Ala Val Val Ile
4225 4230 4235

aac aag gtc cgc gag ggc cag ggc gcg ttc ggc tac aac gcc cgc 72115
Asn Lys Val Arg Glu Gly Gln Gly Ala Phe Gly Tyr Asn Ala Arg
4240 4245 4250

acc gag gtc tac gag gac ctg gag aag gcc ggc gtc atc gac ccg 72160
Thr Glu Val Tyr Glu Asp Leu Glu Lys Ala Gly Val Ile Asp Pro
4255 4260 4265

acg aag gtc gag cgc acc gcg ctg cag aac gcc gcg tcc gtg gcc 72205
Thr Lys Val Glu Arg Thr Ala Leu Gln Asn Ala Ala Ser Val Ala
4270 4275 4280

tcg ctg ctg ctg acc acc gag gcg atg atc gcc gac cgc ccc gcc 72250
Ser Leu Leu Leu Thr Thr Glu Ala Met Ile Ala Asp Arg Pro Ala
4285 4290 4295

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Lys Lys Lys Gly Lys Asn Gly Gly Gly Ala Gly Met Pro Asp Tyr
4300 4305 4310

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Gly Gly Asp Asp Met Asp Tyr
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Val Thr Arg Arg Cys Arg Cys Pro Ser Cys Pro Pro
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Arg Ala Gly Gly Ala Cys Ser Val Ala Trp Pro Ala Pro Tyr Arg
4335 4340 4345
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Ala Arg Pro Arg Ala Pro His Ser Phe Arg His Pro Pro Cys Pro
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cgt cgc ccg ctc ccg cat ccg tgc ccg cat ccg agc ccg agc cac 73482
Arg Arg Pro Leu Pro His Pro Cys Pro His Arg Ser Arg Ser His
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cat ccg gct ccg tgc ctc cgt cct ccg tcg ggc ccg cgt cct ctc 73527
His Pro Ala Pro Cys Leu Arg Pro Pro Ser Gly Pro Arg Pro Leu
4380 4385 4390
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Arg Pro Ser Arg Ser Pro Pro Ser Arg Pro Arg Pro Ala Ala Pro
4395 4400 4405
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Ser Ala Gly Ala Cys Pro Arg Asn Arg Pro Pro Arg Arg Ala Gly
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Arg Thr Gly Ala Arg Val Ser Trp Asp Leu Ser Leu Glu Gly Ala
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Ala Gln Leu Thr Ala Glu Arg Arg Gly Ile Gly Gln Gln Leu Arg
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Lys Ala Arg Gly Gly Thr Gly Ala Gln Arg Leu Gln Arg Arg Leu
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His Gly Glu Val Leu Gly Gln His Asp Glu Gly Gly Ala Leu Gly
4470 4475 4480
cag cgc ctt ggc cag ctc cag cgc ctt gcg ccc ata ggc ccg cgc 73842
Arg Arg Leu Gly Gln Leu Gln Arg Leu Ala Pro Ile Gly Arg Arg
4485 4490 4495
gaa gca cca gct cac cac cac gcc cac ccg cgt cgc cat cgc cat 73887
Glu Val Pro Ala His His His Ala His Arg Arg Arg His Arg His

4500	4505	4510	
cag ctc cgt cga ggg cag cac ccg cgc ctc cag ccc cag cat gtc Gln Leu Arg Arg Gly Gln His Pro Arg Leu Gln Pro Gln His Val 4515 4520 4525			73932
cag ggc ctc gga gat gag ccg cgc cgt cgt cgg gtt gtc ctc cag Gln Gly Leu Gly Asp Glu Pro Arg Arg Arg Arg Val Val Leu Gln 4530 4535 4540			73977
cac gtc cac ccg ccg cac ttc ggc ccc ggg ggc cac cac cgg agg His Val His Pro Pro His Phe Gly Pro Gly Gly His His Arg Arg 4545 4550 4555			74022
cac cgg cgg ctc cga gga cag cgt cgt gcg caa cag ccc gcg cac His Arg Arg Leu Arg Gly Gln Arg Arg Ala Gln Gln Pro Ala His 4560 4565 4570			74067
ctg ccg gat gtc gtc gaa ggg ctt gag cag gta gtc cac cac gcc Leu Pro Asp Val Val Glu Gly Leu Glu Gln Val Val His His Ala 4575 4580 4585			74112
cag ctc cag cgc ctg ctg cgt cgt cac cag cga cgg gta gcc cgt Gln Leu Gln Arg Leu Leu Arg Arg His Gln Arg Arg Val Ala Arg 4590 4595 4600			74157
cat cag gat gac gcg cga gtt gga gta gag ccg ccg cgc ctg ctg His Gln Asp Asp Ala Arg Val Gly Val Glu Pro Pro Arg Leu Leu 4605 4610 4615			74202
cgc cag ctc cag ccc gga cag gcc cgg cag gtt ctt gtc cgt gac Arg Gln Leu Gln Pro Gly Gln Ala Arg Gln Val Leu Val Arg Asp 4620 4625 4630			74247
gat gag gtc cac tgg cgc ctg gcg cag caa atc cag cgc ttc ctc Asp Glu Val His Trp Arg Leu Ala Gln Gln Ile Gln Arg Phe Leu 4635 4640 4645			74292
gcc gct ggc cgc ctc gat gac ctc gca ctc ctt gcc cat cag gtc Ala Ala Gly Arg Leu Asp Asp Leu Ala Leu Leu Ala His Gln Val 4650 4655 4660			74337
gcg gaa gac cat gcg gat gat ggt ctc gtc gtc cac cac cag cag Ala Glu Asp His Ala Asp Asp Gly Leu Val Val His His Gln Gln 4665 4670 4675			74382
ccg ctt gcg cag ctg cgg cgg cgc gtc cgt ggc ggg gaa gag tac Pro Leu Ala Gln Leu Arg Arg Arg Val Arg Gly Gly Glu Glu Tyr 4680 4685 4690			74427
ccg gaa cac ggt ggc cgg cgg ggg cac gtc gcg aat ggc gcc cgg Pro Glu His Gly Gly Arg Arg Gly His Val Ala Asn Gly Ala Arg 4695 4700 4705			74472
cgc cgc gag gcc aat cgt cgc gtt gtg ctc ctg ggc gat gcg ctt Arg Arg Glu Ala Asn Arg Arg Val Val Leu Leu Gly Asp Ala Leu 4710 4715 4720			74517
gca cac cgc cag ccc cag tcc cgt gcc gcg ctt gtt ggc ggt gac Ala His Arg Gln Pro Gln Ser Arg Ala Ala Leu Val Gly Gly Asp 4725 4730 4735			74562
gta ggg ctc gaa gat gcg ctc gcg cag ctc cac ggg gat gcc cgg			74607

Val Gly 4740	Leu Glu Asp 4745	Ala Leu 4745	Ala Gln Leu His 4750	Gly Asp Ala Arg 4750	
gcc cca Ala Pro 4755	gtc cgc cac gta Val Arg His Val 4760	cag Gln 4760	cac cgg aga ggc His Arg Arg Gly 4765	gcc ctc gcg cga Ala Leu Ala Arg 4765	74652
gag cac Glu His 4770	cac ctt cac gcg His Leu His Ala 4775	ccc Pro 4775	gcg gcc ggc cat Ala Ala Gly His 4780	ggc gtc gcg cgc Gly Val Ala Arg 4780	74697
gtt gtt Val Val 4785	cag cag gtt cag Gln Gln Val Gln 4790	cgt Arg 4790	gag ctg ctc gat Glu Leu Leu Asp 4795	gag ccg cgc gtt Glu Pro Arg Val 4795	74742
gcc ctg Ala Leu 4800	gat ggt gat gtc Asp Gly Asp Val 4805	ctc Leu 4805	ggg cgc ctc cac Gly Arg Leu His 4810	ctc cag aga cat Leu Gln Arg His 4810	74787
gcg cgc Ala Arg 4815	cga gtc cgg gtt Arg Val Arg Val 4820	gac Asp 4820	gct gaa cag ctt Ala Glu Gln Leu 4825	cgc cgc cgc cca Arg Arg Arg Pro 4825	74832
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gct ggc Ala Gly 4845	gag gcg gat gta Glu Ala Asp Val 4850	gtc Val 4850	gga gac gat ctg Gly Asp Asp Leu 4855	ttc cat ccg ctc Phe His Pro Leu 4855	74922
cac ctg His Leu 4860	cgc cag cag cag Arg Gln Gln Gln 4865	ccg Pro 4865	cag cgg gcc ggt Gln Arg Ala Gly 4870	ggg gcc acc gtc Gly Ala Thr Val 4870	74967
ctc cgc Leu Arg 4875	gag cag ctg cgc Glu Gln Leu Arg 4880	gta Val 4880	ggc ctt cac gcc Gly Leu His Ala 4885	cag ggg ctg Gln Gln Gly Leu 4885	75012
ccg cag Pro Gln 4890	ctc gtg cag cac Leu Val Gln His 4895	ctc Leu 4895	cgc cgc cag ctg Arg Arg Gln Leu 4900	tgc cga gtg cgc Cys Arg Val Arg 4900	75057
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tgt ttc Cys Phe 4935	cat ggc ccg agc His Gly Pro Ser 4940	atg Met 4940	gcg gag gca gcg Ala Glu Ala Ala 4945	gta tct acg caa Val Ser Thr Gln 4945	75192
cgc ggg Arg Gly 4950	cgg agg gat tcc Arg Arg Asp Ser 4955	gtt Val 4955	gac ccg ggc ccc Asp Pro Gly Pro 4960	tgg ccg cgc gga Trp Pro Arg Gly 4960	75237
tgc tcc Cys Ser 4965	tcg cgt ccc ctg Ser Arg Pro Leu 4970	gcg Ala 4970	ccc cgt cca gaa Pro Arg Pro Glu 4975	cgt gga cgc cac Arg Gly Arg His 4975	75282

cac cgg cct cgg gag ggc ctt cat gcc gca gac caa ccc gtt cca	75327
His Arg Pro Arg Glu Gly Leu His Ala Ala Asp Gln Pro Val Pro	
4980 4985 4990	
ctc gct ggt gcc ccg gaa gat gac cga ctc cga gct ggc ccg ctc	75372
Leu Ala Gly Ala Pro Glu Asp Asp Arg Leu Arg Ala Gly Pro Leu	
4995 5000 5005	
cat ccg gct gaa cat cga ggc gga gct gga cgc cat caa cct cta	75417
His Pro Ala Glu His Arg Gly Gly Ala Gly Arg His Gln Pro Leu	
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Arg Arg Pro His Arg Cys His Arg Gln Arg Gly Gly Gln Gly His	
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Pro Pro Ser Arg His Gly Arg Gly Ala Arg Ala Arg Arg Pro Leu	
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Leu	Leu	Ala	Gly	Thr	Phe	Glu	Ala	Phe	Asp	Glu	Asn	Arg	Ala	Arg	
5120					5125					5130					
gcc	gcc	cgc	gcc	gat	gac	cac	atc	gcc	aag	ccc	ttc	gag	agc	cag	78408
Ala	Ala	Arg	Ala	Asp	Asp	His	Ile	Ala	Lys	Pro	Phe	Glu	Ser	Gln	
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Val	Leu	Leu	Asp	Lys	Val	Lys	Ala	Leu	Val	Gly	Gln	Lys	Ser	Asn	
5150					5155					5160					
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Thr	Met	Pro	Ala	Ser	Ala	Ala	Thr	Gln	Val	Arg	Pro	Pro	Thr	Ala	
5165					5170					5175					
cag	ccg	gcc	act	ccc	gcg	ccg	gtg	cct	ccg	ggc	ccg	cag	ccg	ggc	78543
Gln	Pro	Ala	Thr	Pro	Ala	Pro	Val	Pro	Pro	Gly	Pro	Gln	Pro	Gly	
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Ala	Pro	Thr	Ala	Ala	Arg	Pro	Gly	Ile	Pro	Gln	Gly	Thr	Gln	Pro	
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Met	Ala	Arg	Pro	Pro	Gly	Pro	Gly	Met	Pro	Pro	Pro	Gly	Ala	Pro	
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Met	Ala	Arg	Pro	Pro	Gly	Pro	Gly	Met	Pro	Pro	Pro	Gly	Ala	Pro	
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Ala	Ala	Arg	Pro	Gly	Arg	Ala	Ala	Ser	Ala	Gly	Cys	Val	Arg	Ala	
5300					5305					5310					
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Gly	His	Ala	Ala	Ala	Ser	Gly	Arg	Ala	Arg	Ala	Ser	Gly	Trp	Ala	
5315					5320					5325					
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Gly	Ala	Gly	Met	Ala	Arg	Pro	Gly	Ile	Pro	Gln	Gly	Ser	Gln	Pro	
5330					5335					5340					
ggc	ttc	ccg	cgt	cct	ccg	ggc	ggc	gcc	gcg	ccg	ctg	cct	ccc	gcg	79038
Gly	Phe	Pro	Arg	Pro	Pro	Gly	Gly	Ala	Ala	Pro	Leu	Pro	Pro	Ala	
5345					5350					5355					

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Pro Gly Gly Ala Thr Gln	Pro Ala Ala Arg Ala	Arg Asp Pro Phe	
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ggc ctg ggc gct ccc acg	gcg gcg ccg cag gca	gcc cag cct tcc	79128
Gly Leu Gly Ala Pro Thr	Ala Ala Pro Gln Ala	Ala Gln Pro Ser	
5375	5380	5385	
atc agc atc gag gac tcg	ctg ccc gag ccc agc	ggg gcc gag gag	79173
Ile Ser Ile Glu Asp Ser	Leu Pro Glu Pro Ser	Gly Ala Glu Glu	
5390	5395	5400	
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Ile Ser Leu Asp Met Gly	Gly Pro Pro Thr Ala	Ala Pro Thr Ala	
5405	5410	5415	
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Val Ala Pro Thr Ala Ala	Pro Ala Thr Ala Arg	Pro Thr Ala Ala	
5420	5425	5430	
gat ggt ggc gag gcg ctg	ctg cgc gag gcg ctc	tcg aag gcc tcc	79308
Asp Gly Gly Glu Ala Leu	Leu Arg Glu Ala Leu	Ser Lys Ala Ser	
5435	5440	5445	
cgc gag gtc atc gag aag	att gcc tgg gag gtg	gta ccg cag ctg	79353
Arg Glu Val Ile Glu Lys	Ile Ala Trp Glu Val	Val Pro Gln Leu	
5450	5455	5460	
gcg gag acc atc atc cgt	gag gag ctc gag cgg	ctc atc aag gac	79398
Ala Glu Thr Ile Ile Arg	Glu Glu Leu Glu Arg	Leu Ile Lys Asp	
5465	5470	5475	
cgg gag acg cag cac tga	cgcggttcctc gccttaacct	ctctccaaga	79446
Arg Glu Thr Gln His			
5480			
ccttcccgcc ggccccgggtt	cccccggggc tggccgtccg	caatgaccga caccactgaa	79506
ctgtccaagg cctacgagcc	caccgagggtc gagggccgct	ggtacgcctg ctgg atg	79563
		Met	
		5485	
gag cgg aac tac ttc	cgc gcc gag gcg acc	tcc gac aag ccc gcc	79608
Glu Arg Asn Tyr Phe	Arg Ala Glu Ala Thr	Ser Asp Lys Pro Ala	
5490	5495	5500	
ttc tcc atc gtg ctg	ccg ccg ccc aac gtg	acg ggc agc ctc cac	79653
Phe Ser Ile Val Leu	Pro Pro Pro Asn Val	Thr Gly Ser Leu His	
5505	5510	5515	
atc ggc cac gcg ctc	acc gcc acc atc cag	gac atc ctc gcg cgc	79698
Ile Gly His Ala Leu	Thr Ala Thr Ile Gln	Asp Ile Leu Ala Arg	
5520	5525	5530	
tgg aag cgg atg agc	ggc ttc aac acc ctg	tgg ctc ccc ggc acg	79743
Trp Lys Arg Met Ser	Gly Phe Asn Thr Leu	Trp Leu Pro Gly Thr	
5535	5540	5545	
gac cac gcc ggc atc	gcc acg cag atg gtg	gtg gag aag gag ctg	79788
Asp His Ala Gly Ile	Ala Thr Gln Met Val	Val Glu Lys Glu Leu	
5550	5555	5560	

195

aag aag acc gag ggc	aag agc cgg cac gac	ctc ggc cgc gcc gcc	79833
Lys Lys Thr Glu Gly	Lys Ser Arg His Asp	Leu Gly Arg Ala Ala	
5565	5570	5575	
ttc ctg gag cgc gtc	tgg gag tgg aag ggc	aag tac ggc gcc cgc	79878
Phe Leu Glu Arg Val	Trp Glu Trp Lys Gly	Lys Tyr Gly Ala Arg	
5580	5585	5590	
atc ggc gag cag cac	cgc ttc ctg ggc gcc	tcg ctg gac tgg agc	79923
Ile Gly Glu Gln His	Arg Phe Leu Gly Ala	Ser Leu Asp Trp Ser	
5595	5600	5605	
cgc gag cgc ttc acc	atg gac gag cag tcc	tcc gcc gcc gtg cgc	79968
Arg Glu Arg Phe Thr	Met Asp Glu Gln Ser	Ser Ala Ala Val Arg	
5610	5615	5620	
gag gtc ttc gtg cgc	ctg tac gaa gag ggc	ctg atg tac cgg gcc	80013
Glu Val Phe Val Arg	Leu Tyr Glu Glu Gly	Leu Met Tyr Arg Ala	
5625	5630	5635	
cag aag ctc atc aac	tgg tgc ccc tcg tgc	cgc acc gcc ctc agc	80058
Gln Lys Leu Ile Asn	Trp Cys Pro Ser Cys	Arg Thr Ala Leu Ser	
5640	5645	5650	
gac ttg gag gtg gag	cac gag gag tcg aag	aag ggc tcc atc tgg	80103
Asp Leu Glu Val Glu	His Glu Glu Ser Lys	Lys Gly Ser Ile Trp	
5655	5660	5665	
cac atc cgc tac ccc	gtc aag gac agc gac	cgc acg ctc acc gtg	80148
His Ile Arg Tyr Pro	Val Lys Asp Ser Asp	Arg Thr Leu Thr Val	
5670	5675	5680	
gcc acc aca cgc ccg	gag acg atg ctg ggc	gac acc gcg gtg gcc	80193
Ala Thr Thr Arg Pro	Glu Thr Met Leu Gly	Asp Thr Ala Val Ala	
5685	5690	5695	
atc cac ccg gag gac	gag cgc tac ctg ggg	ctg gcc ggc aag agc	80238
Ile His Pro Glu Asp	Glu Arg Tyr Leu Gly	Leu Ala Gly Lys Ser	
5700	5705	5710	
gtg aag ctg ccg ctg	acc gac cgc gag att	ccc atc atc gcg gac	80283
Val Lys Leu Pro Leu	Thr Asp Arg Glu Ile	Pro Ile Ile Ala Asp	
5715	5720	5725	
gcg gag ctg gtg gac	ccg aag ttc ggc acc	ggc gtg gtg aag gtg	80328
Ala Glu Leu Val Asp	Pro Lys Phe Gly Thr	Gly Val Val Lys Val	
5730	5735	5740	
acg ccg gcg cac gac	ttc aac gac tac cag	acg ggc ctg cgg cac	80373
Thr Pro Ala His Asp	Phe Asn Asp Tyr Gln	Thr Gly Leu Arg His	
5745	5750	5755	
aag ctg ccc atg ctc	acc atc ctg gac gaa	gcg gcc cgg atg acg	80418
Lys Leu Pro Met Leu	Thr Ile Leu Asp Glu	Ala Ala Arg Met Thr	
5760	5765	5770	
aag gag acc ggc aag	tac gcc ggc atg gat	cgc ttc gag gcg cgc	80463
Lys Glu Thr Gly Lys	Tyr Ala Gly Met Asp	Arg Phe Glu Ala Arg	
5775	5780	5785	
aag cag gtg ctg gcg	gac ctc acg gag cag	ggg ctg ctg gag aag	80508
Lys Gln Val Leu Ala	Asp Leu Thr Glu Gln	Gly Leu Leu Glu Lys	
5790	5795	5800	

gaa gag ccc cac atg	ctg aac gtg ggc acc	tgc cag cgc tgc gcc	80553
Glu Glu Pro His Met	Leu Asn Val Gly Thr	Cys Gln Arg Cys Ala	
5805	5810	5815	
acg gtg gtg gag cca	cgc ctg tct ccg cag	tgg ttc atc aag att	80598
Thr Val Val Glu Pro	Arg Leu Ser Pro Gln	Trp Phe Ile Lys Ile	
5820	5825	5830	
gaa ccg ctg gcg aag	ccg gcc atc gag gcg	gtg gag cag gcc cgc	80643
Glu Pro Leu Ala Lys	Pro Ala Ile Glu Ala	Val Glu Gln Gly Arg	
5835	5840	5845	
acg aag ttc gtc ccc	gag tcc tgg acg aac	acg ttc ttc cac tgg	80688
Thr Lys Phe Val Pro	Glu Ser Trp Thr Asn	Thr Phe Phe His Trp	
5850	5855	5860	
atg cgc aac atc cac	gac tgg tgc gtc agc	cgc cag ctg tgg tgg	80733
Met Arg Asn Ile His	Asp Trp Cys Val Ser	Arg Gln Leu Trp Trp	
5865	5870	5875	
ggc cac cag att ccc	gcg tac tac tgc acc	tcg tgc agc ccg cgg	80778
Gly His Gln Ile Pro	Ala Tyr Tyr Cys Thr	Ser Cys Ser Pro Arg	
5880	5885	5890	
cag ggc gac gac acg	gac ctg ccg ctg gac	gcc ccc acg gtg aag	80823
Gln Gly Asp Asp Thr	Asp Leu Pro Leu Asp	Ala Pro Thr Val Lys	
5895	5900	5905	
gtg ggc ggg gtg gac	ttc gcg cgc gcg gag	ccc atc gtc gcg cgc	80868
Val Gly Gly Val Asp	Phe Ala Arg Ala Glu	Pro Ile Val Ala Arg	
5910	5915	5920	
gag cag ccg aag tcc	tgc ccg aag tgc ggc	ggc gcg tcc ttc atc	80913
Glu Gln Pro Lys Ser	Cys Pro Lys Cys Gly	Gly Ala Ser Phe Ile	
5925	5930	5935	
cag gac ccg gac gtg	ctg gac acc tgg ttc	tcg tcc ggc ctg tgg	80958
Gln Asp Pro Asp Val	Leu Asp Thr Trp Phe	Ser Ser Gly Leu Trp	
5940	5945	5950	
ccg ttc tcc acg ctg	ggc tgg ccg cgt gag	acg ccg gag ctg aag	81003
Pro Phe Ser Thr Leu	Gly Trp Pro Arg Glu	Thr Pro Glu Leu Lys	
5955	5960	5965	
acc ttc tac ccg acg	tcc gtc atg gag acg	ggc cac gac atc atc	81048
Thr Phe Tyr Pro Thr	Ser Val Met Glu Thr	Gly His Asp Ile Ile	
5970	5975	5980	
ttc ttc tgg gtc gcc	cgg atg atg atg atg	ggc atc cac ttc atg	81093
Phe Phe Trp Val Ala	Arg Met Met Met Met	Gly Ile His Phe Met	
5985	5990	5995	
ggg gat gtg ccc ttc	cgc acc gtg tac ctg	cac gcg atg gtg cgc	81138
Gly Asp Val Pro Phe	Arg Thr Val Tyr Leu	His Ala Met Val Arg	
6000	6005	6010	
gac gag aag ggc cag	aag atg tcc aag acg	aag ggg aac gtc atc	81183
Asp Glu Lys Gly Gln	Lys Met Ser Lys Thr	Lys Gly Asn Val Ile	
6015	6020	6025	
gac ccc ctg gac atc	gtc ctc ggc gcc ccg	gcc gac aag ctc cag	81228
Asp Pro Leu Asp Ile	Val Leu Gly Ala Pro	Ala Asp Lys Leu Gln	

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6030	6035	6040	
ccg acg ctg aag aac Pro Thr Leu Lys Asn 6045	cgg ttc ccg cag ggc Arg Phe Pro Gln Gly 6050	atg ccg ccg ttc ggc Met Pro Pro Phe Gly 6055	81273
gcg gac gcg ctg cgc Ala Asp Ala Leu Arg 6060	ttc acg ctc gcc tcg Phe Thr Leu Ala Ser 6065	ctc acc cag cag ggc Leu Thr Gln Gln Gly 6070	81318
cgc gac atc aag ctg Arg Asp Ile Lys Leu 6075	tcg atg gac cgg ctc Ser Met Asp Arg Leu 6080	gag ggc tac aag gcc Glu Gly Tyr Lys Ala 6085	81363
ttc ggc aac aag ctg Phe Gly Asn Lys Leu 6090	tgg aac gcc agc cgc Trp Asn Ala Ser Arg 6095	ttc gcc ctg atg aac Phe Ala Leu Met Asn 6100	81408
atg ggc gac ttc cgc Met Gly Asp Phe Arg 6105	atg gag gcc ggc ccg Met Glu Ala Gly Pro 6110	ctg gac cgg agc aca Leu Asp Arg Ser Thr 6115	81453
ctg acg ctg gcg gac Leu Thr Leu Ala Asp 6120	cgc tgg att ctc tcc Arg Trp Ile Leu Ser 6125	cgc ctc cag cgc gcc Arg Leu Gln Arg Ala 6130	81498
acc acg gag gcg cgc Thr Thr Glu Ala Arg 6135	gcg ctg ctg gag tcg Ala Leu Leu Glu Ser 6140	tac agc ttc ggc gag Tyr Ser Phe Gly Glu 6145	81543
gcc gcc tcc acg ctc Ala Ala Ser Thr Leu 6150	tac cag ttc ctc tgg Tyr Gln Phe Leu Trp 6155	gcg gag ttc tgc gac Ala Glu Phe Cys Asp 6160	81588
tgg tac atc gag ctg Trp Tyr Ile Glu Leu 6165	gcg aag ggc tcg ctg Ala Lys Gly Ser Leu 6170	tac ggc gag gac gcg Tyr Gly Glu Asp Ala 6175	81633
gcg gcg aag gac tcc Ala Ala Lys Asp Ser 6180	acg cgc cgg gtg ctc Thr Arg Arg Val Leu 6185	gtg tac tgc ctg gac Val Tyr Cys Leu Asp 6190	81678
cgc atc ctg cgg ctg Arg Ile Leu Arg Leu 6195	ctg cac ccg ttc atg Leu His Pro Phe Met 6200	ccg ttc atc acc gag Pro Phe Ile Thr Glu 6205	81723
gag atc tgg cag aag Glu Ile Trp Gln Lys 6210	ctg ccg atg gcc cgg Leu Pro Met Ala Arg 6215	ccg acg gac agc atc Pro Thr Asp Ser Ile 6220	81768
atg att gcc ccg tac Met Ile Ala Pro Tyr 6225	ccg gag ccg gac gcg Pro Glu Pro Asp Ala 6230	gcg cac gtg gac gag Ala His Val Asp Glu 6235	81813
gcg gcg gaa ggc gag Ala Ala Glu Gly Glu 6240	atg gcg ccg gtc atc Met Ala Pro Val Ile 6245	gcc gcc atc gag ggc Ala Ala Ile Glu Gly 6250	81858
ctg cgc acc atc cgc Leu Arg Thr Ile Arg 6255	ggc gag agc aac ctg Gly Glu Ser Asn Leu 6260	tcg ccc gcc acc aag Ser Pro Ala Thr Lys 6265	81903
gtg aag gcg gtg gtg	cag agc gcg gac gtg	cgc acg cgc gag ctg	81948

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Val	Lys	Ala	Val	Val	Gln	Ser	Ala	Asp	Val	Arg	Thr	Arg	Glu	Leu	
				6270					6275					6280	
ctg	gag	cgc	tgg	cgc	ggc	tac	ctc	atg	ccg	ctg	gcc	ggc	ctg	tcc	81993
Leu	Glu	Arg	Trp	Arg	Gly	Tyr	Leu	Met	Pro	Leu	Ala	Gly	Leu	Ser	
				6285					6290					6295	
gag	gtg	acg	gtg	gga	gcg	ccg	ggc	gcc	aag	ccg	ccg	cag	gcc	gcc	82038
Glu	Val	Thr	Val	Gly	Ala	Pro	Gly	Ala	Lys	Pro	Pro	Gln	Ala	Ala	
				6300					6305					6310	
gcc	ttc	gtg	ggc	tcc	aac	ctg	gag	atc	tac	gtc	ccg	ctg	gcg	ggc	82083
Ala	Phe	Val	Gly	Ser	Asn	Leu	Glu	Ile	Tyr	Val	Pro	Leu	Ala	Gly	
				6315					6320					6325	
ctc	gtc	gac	ctg	gac	gcg	gag	cgc	gag	cgg	ttg	aag	aag	gag	att	82128
Leu	Val	Asp	Leu	Asp	Ala	Glu	Arg	Glu	Arg	Leu	Lys	Lys	Glu	Ile	
				6330					6335					6340	
gcc	cgc	gcc	gag	cag	gag	atg	gcc	ggc	gtg	ctg	cgc	aag	ctg	gag	82173
Ala	Arg	Ala	Glu	Gln	Glu	Met	Ala	Gly	Val	Leu	Arg	Lys	Leu	Glu	
				6345					6350					6355	
aac	ccc	aac	ttc	gtg	gcc	aag	gcg	ccc	ccg	gac	gtg	gtg	gag	aag	82218
Asn	Pro	Asn	Phe	Val	Ala	Lys	Ala	Pro	Pro	Asp	Val	Val	Glu	Lys	
				6360					6365					6370	
gac	cgc	gcc	cgc	gtc	gag	gag	ctg	aag	gag	cgc	aag	gcc	aag	ctt	82263
Asp	Arg	Ala	Arg	Val	Glu	Glu	Leu	Lys	Glu	Arg	Lys	Ala	Lys	Leu	
				6375					6380					6385	
cag	gac	cac	ctg	cag	cgg	att	gcc	ccg	gag	ccc	gcc	atg	cca	gag	82308
Gln	Asp	His	Leu	Gln	Arg	Ile	Ala	Pro	Glu	Pro	Ala	Met	Pro	Glu	
				6390					6395					6400	
acg	ccg	ccg	tcc	gag	agc	acc	act	ccc	gag	agc	agc	acc	ccc	acc	82353
Thr	Pro	Pro	Ser	Glu	Ser	Thr	Thr	Pro	Glu	Ser	Ser	Thr	Pro	Thr	
				6405					6410					6415	
gcg	gaa	gag	ggt	gcc	tcc	ccc	tcc	gcc	ccg	gcc	cag	gtg	aag	gtc	82398
Ala	Glu	Glu	Gly	Ala	Ser	Pro	Ser	Ala	Pro	Ala	Gln	Val	Lys	Val	
				6420					6425					6430	
gcc	ccg	aat	cag	gaa	gag	aag	ggc	ggc	gtg	gac	ctg	ggc	cag	gag	82443
Ala	Pro	Asn	Gln	Glu	Glu	Lys	Gly	Gly	Val	Asp	Leu	Gly	Gln	Glu	
				6435					6440					6445	
ctg	aag	ggt	gaa	ctg	ggc	gag	acc	ggc	acc	gcg	tcc	gag	gcc	ggg	82488
Leu	Lys	Gly	Glu	Leu	Gly	Glu	Thr	Gly	Thr	Ala	Ser	Glu	Ala	Gly	
				6450					6455					6460	
gac	acg	cag	gtg	cag	gac	gcg	ctc	gcg	aag	ctg	cgc	gag	ggc	acg	82533
Asp	Thr	Gln	Val	Gln	Asp	Ala	Leu	Ala	Lys	Leu	Arg	Glu	Gly	Thr	
				6465					6470					6475	
aag	gag	ggc	ctg	tcg	cca	tcc	gac	cac	cat	gac	ctc	ggc	gtg	gcg	82578
Lys	Glu	Gly	Leu	Ser	Pro	Ser	Asp	His	His	Asp	Leu	Gly	Val	Ala	
				6480					6485					6490	
tac	atg	acc	atg	ggg	ctg	gtg	gac	gac	gcg	atg	cgc	gag	ttc	aac	82623
Tyr	Met	Thr	Met	Gly	Leu	Val	Asp	Asp	Ala	Met	Arg	Glu	Phe	Asn	
				6495					6500					6505	

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cgg gcc aag gag ggt ggc gac acc cgc gag acg ccg gcc gag ggc 82668
 Arg Ala Lys Glu Gly Gly Asp Thr Arg Glu Thr Pro Ala Glu Gly
 6510 6515 6520

gcc gag gcg gag gag ggt gag tcc ggc ccg gtg aag gcc cac ggg 82713
Ala Glu Ala Glu Glu Gly Glu Ser Gly Pro Val Lys Ala His Gly
6525 6530 6535

gac atg ctg ccc acg cgc gag gtg acg cag ggc gag ccc gtg cgc 82758
Asp Met Leu Pro Thr Arg Glu Val Thr Gln Gly Glu Pro Val Arg
6540 6545 6550

tcc gcc tcg aag aag aag gcg acc gct ccc ggc aag gtg cac ggc	82803
Ser Ala Ser Lys Lys Lys Ala Thr Ala Pro Gly Lys Val His Gly	
6555	6560 6565

gac aag ctg gcg ccc gcc ccg acc acc gag gag gcc gag gcc ccc 82848
Asp Lys Leu Ala Pro Ala Pro Thr Thr Glu Glu Ala Glu Ala Pro
6570 6575 6580

gcg gtg aag aag gcg gcc gc 82868
Ala Val Lys Lys Ala Ala
6585

<210> 19

<211> 358

<212> PRT

<213> Angiococcus disciformis

<400> 19

Val Gly Arg Gly Leu Gln Pro Leu Pro Pro Asp Ala Pro His Pro Arg
1 5 10 15

Pro Ala Arg Cys Glu Gly Arg Arg Trp Gln Gly Leu Gly Ala His Gly
20 25 30

Gln Pro His Leu Arg Pro Arg Arg Gly Glu Ser Gly Pro Gly Arg Cys
35 40 45

Arg Asp Gly Ser His Arg Glu Gly Thr His Pro Pro Gln Ser Arg Ser
50 55 60

Tyr Leu Ala Met Thr Ala Asp Ser Met Asp Ala Thr Val Pro Ser Arg
65 70 75 80

Arg Pro Ala Leu Gly Phe Ile Gly Gly Gly Val Met Ala Glu Ala Leu
85 90 95

Ile Gly Ala Val Thr Gly Gly Gly Leu Ala Ala Pro Gly Thr Leu Leu
100 105 110

Val Gly Glu Val Asp Glu Glu Arg Arg Arg Val Leu Arg Glu Gln Tyr
 115 120 125

Gly Val Glu Val Thr Ala Asp Asn Leu Ala Ala Ala Asp Ala Glu Leu
 130 135 140

Val Val Leu Ala Val Lys Pro Gln His Leu Gly Val Val Leu Gln Gln
 145 150 155 160

Leu Arg Gly Gln Leu Arg Glu Asp Thr Ile Val Val Ser Ile Ile Ala
 165 170 175

Gly Ala Arg Leu Gln Thr Leu Cys Glu Gly Leu Glu His Pro Leu Val
 180 185 190

Val Arg Ala Met Pro Asn Thr Pro Ala Arg Val Arg Lys Ala Ala Thr
 195 200 205

Phe Trp Ile Pro Ser Ala Gly Leu Ser Glu Pro Ala Leu Val Arg Val
 210 215 220

Arg Ser Leu Leu Gly Ala Leu Gly Thr Glu Val Glu Val Ala Asp Glu
 225 230 235 240

Ala Gly Val Glu Met Ala Thr Gly Leu Ala Gly Pro Met Pro Ala Phe
 245 250 255

Val Tyr Phe Leu Ile Glu Ala Phe Ile Asp Ala Gly Val Ala Leu Gly
 260 265 270

Leu Pro Arg Asp Gln Ala Thr Leu Ala Thr Val Glu Ser Met Arg Gly
 275 280 285

Ser Leu Glu Leu Leu His Arg Ser Gln Glu Ser Pro Ala Ala Leu Arg
 290 295 300

Lys Gln Val Thr Ser Pro Gly Gly Ala Thr Leu Ala Gly Leu Lys Val
 305 310 315 320

Phe Glu Ser Ala Gly Val Arg Asp Ala Met Asp Ala Ala Val Arg Ala
 325 330 335

Val His Ala Arg Ala Gln Glu Leu Gly Arg Leu Pro Leu Ala Pro Leu
 340 345 350

Glu Pro Gly Lys Glu Gly

355

<210> 20

<211> 420

<212> PRT

<213> Angiococcus disciformis

<400> 20

Val Pro Gly Val Ala Val Ala Val Val Ser His Gly Arg Val Ile Val
1 5 10 15

Ala Lys Gly Tyr Gly Phe Ser Asn Leu Glu His Gln Val Pro Val Thr
20 25 30

Pro Asp Thr Leu Phe Gln Ser Gly Ser Leu Gly Lys Gln Phe Thr Ala
35 40 45

Met Ala Val Met Leu Gln Val Glu Ala Gly Arg Ile Ser Leu Ser Asp
50 55 60

Ser Ile Thr Lys Tyr Phe Pro Asp Ala Pro Ser Thr Trp Ala Pro Ile
65 70 75 80

Thr Ile Arg His Leu Leu Thr His Thr Ser Gly Leu Ser Asp Gly Leu
85 90 95

Leu Asp Leu Arg Lys Asp Tyr Thr Asp Glu Glu Phe Ala Gln Phe Leu
100 105 110

Tyr Thr Leu Pro Leu Asp Phe Pro Ala Gly Leu Arg Trp Asn Tyr Ser
115 120 125

Asn Ala Gly Tyr Val Leu Leu Gly Leu Leu Val Asn Arg Val Ala Gly
130 135 140

Thr Ser Tyr Val Asn Val Leu Gly Glu Gln Val Phe Lys Pro Thr Arg
145 150 155 160

Met Lys Thr Ala Arg Gly Ile Ser Glu Ala Asp Ile Val Pro Asn Arg
165 170 175

Ala Ala Gly Tyr Arg Leu Leu Asp Gly Val Val Lys Asn Gln Glu Trp
180 185 190

202

Val Ser Pro Ser Leu Asn Thr Thr Ala Asp Gly Ser Leu Tyr Phe Ser
195 200 205

Leu Lys Asp Met Leu Ala Trp Asp Asp Ala Val Asp Asp Arg Ala Ile
210 215 220

Leu Thr Asn Gly Ser Trp Arg Asp Ile Leu Ser Pro Val Lys Leu Ser
225 230 235 240

Ser Gly Ala Ser Tyr Pro Tyr Gly Phe Gly Trp Phe Ile Glu Glu Arg
245 250 255

Asn Gly Gln Leu Val His Gln His Ala Gly Ala Trp Gln Gly Phe Lys
260 265 270

Thr Ala Tyr Tyr Arg Phe Thr Gly Asp Ala Leu Ser Ile Ile Val Leu
275 280 285

Leu Asn Leu Ala Glu Pro Asn Pro Ala Ala Ile Ala Asn Gly Ile Ala
290 295 300

Ala Ile Val Asn Pro Ala Leu Ala Val Pro Pro Leu Ala Pro Ile Pro
305 310 315 320

Asp Leu Glu Pro Glu Val Thr Ala Arg Leu Ala Thr Leu Leu Glu Gln
325 330 335

Ala Arg Ala Gly Ala Leu Asn Pro Ala Glu Phe Ala Tyr Val Pro Gly
340 345 350

Trp Phe Phe Thr Glu Ala Ala Pro Tyr Tyr Gln Ser Leu Leu Gln Ser
355 360 365

Leu Gly Pro Ser Gly Pro Leu Val Leu Ala Lys Arg Glu Met Arg Gly
370 375 380

Asp Asp Arg Val Tyr Thr Tyr Leu Val Gln Ala Gly Ser Thr Met Leu
385 390 395 400

Arg Tyr Arg Val Ala Leu Ile Pro Asp Gly Arg Val Ser Ala Phe Ala
405 410 415

Leu Ser Pro Asn
420

<210> 21

<211> 184

<212> PRT

<213> *Angiococcus disciformis*

<400> 21

Val Ser Ile Arg Arg Thr Thr Ala Ser Thr Arg Asn Val Thr Val Ser
1 5 10 15

Ala Met Leu Asp Pro Ala Leu Gly Ser Ala Arg Asp Ala Leu Gln Val
20 25 30

Phe Leu Glu Lys Ala Leu Arg Ala Gln Phe Gly Ala Asp Trp Gln Gly
35 40 45

Thr Leu Glu Arg Asp Arg Leu Ala Gln Gly Arg Pro Thr Ser Glu Arg
50 55 60

Trp Asp Trp Gly Ser Ile Ser Tyr Arg Leu Gly His Phe Arg Ser Pro
65 70 75 80

Gln Ala Thr Gly Ser Gly Val Val Thr Glu Pro Ile Val Ala Leu Ala
85 90 95

Arg Leu Ala Lys Ala Tyr Arg Asn Leu Phe Gln His Glu Glu Leu Thr
100 105 110

Asp Ala Gln Val Arg His Ala Met Glu Gly Leu Ala Leu Leu Gln Glu
115 120 125

Ala Leu Gly Asn Lys Thr Arg Ala Ala Glu Thr Arg Ala Ala Leu Glu
130 135 140

Val Trp Ala Gly Pro Pro Ala Arg Ala Ala Lys Arg Pro Ala Arg Lys
145 150 155 160

Ala Pro Ala Ala Ala Lys Arg Ala Lys Pro Ala Ala Lys Lys Lys Ala
165 170 175

Pro Lys Ala Lys Ser Ala Arg Arg
180

<210> 22

<211> 351

<212> PRT

<213> Angiococcus disciformis

<400> 22

Met Thr Ser Gly Thr Arg Lys Thr Gly Gly Asp Gly Ala Arg Arg Asn
1 5 10 15

Asp Lys Tyr Arg Ile Leu Ser Leu Asp Gly Gly Gly Leu Arg Thr Leu
20 25 30

Leu Ser Ile Gly Leu Leu Lys Arg Ile Asp Gln Leu Arg Pro Gly Phe
35 40 45

Leu Asp Gln Val Asp Leu Val Ala Gly Thr Ser Ala Gly Ala Ile Ser
50 55 60

Ala Leu Ile Ile Ala Ala Ala Arg Glu Pro Ala Val Gly Leu Glu Gln
65 70 75 80

Ala Arg Gln Ile Trp Phe Thr Pro Gly Leu Phe Asp Ser Pro Leu Ser
85 90 95

Asn Gln Leu Gly Ala Leu Val Gly Gln Ser Ala Leu Met Pro Ser Glu
100 105 110

Asn Met Ala Arg Ala Leu Thr His Ile Leu Gly Asp Lys Thr Leu Arg
115 120 125

Asp Leu Lys Arg Lys Val Val Ile Pro Ala Phe Gln Leu Asp Asp Gly
130 135 140

Asp Pro Asp Glu Asp Arg Arg Gly Trp Arg Pro Arg Ile Phe His Asn
145 150 155 160

Phe Pro Gly Asp Thr Phe Val Asn Leu Asp Asp Tyr Leu Val Asp Leu
165 170 175

Ala Leu Arg Ser Ser Ser Leu Pro Ile Val Ser Pro Val His Gln Gly
180 185 190

Tyr Val Asp Gly Gly Leu Phe Ala Asn Asn Pro Thr Met Ser Ala Val
195 200 205

Ala Gln Ala Ile Tyr Ala Lys Ala Ala Asp Val Arg Asp Ile Leu Val
210 215 220

Phe Ser Leu Gly Thr Gly Asp Ser Val Asp Tyr Leu Asp Gly Tyr Asn
225 230 235 240

Glu Asn Trp Gly Trp Arg Lys Trp Leu Leu Asp Pro Lys Gln Pro Met
245 250 255

Ala Phe Val Ala Ala Thr Ile Glu Ala Gly Val Glu Ala Ile Asp Phe
260 265 270

Gln Ala Lys Met Leu Leu Pro Arg Gly Asn Tyr Trp Arg Glu Asp Pro
275 280 285

Val Val Pro Phe Asn Leu Gly Asn Ser Val Glu Ala Gln Ile Ala Thr
290 295 300

Leu Asp Arg Val Val Lys Arg His Asp Leu Ser Lys Val Leu Glu Trp
305 310 315 320

Val Glu Asn Ser Gly Trp Gln Pro Lys Ala Thr Gln Glu Thr Ala Ser
325 330 335

Gly Ala Gln Arg Glu Phe Ser Gly Glu Ser Gly Glu Ala Arg Ser
340 345 350

<210> 23

<211> 351

<212> PRT

<213> Angiococcus disciformis

<400> 23

Met Thr Ile Ile His Gly Gln Pro Gly Ala Asp Gly Ala Arg Arg Asn
1 5 10 15

Gly Lys Tyr Arg Ile Leu Ser Leu Asp Gly Gly Gly Leu Arg Thr Leu
20 25 30

Leu Ser Ile Gly Leu Leu Lys Arg Ile Asp Gln Leu Arg Pro Gly Phe
35 40 45

Leu Asp Gln Val Asp Leu Val Ala Gly Thr Ser Ala Gly Ala Ile Ser
50 55 60

Ala Leu Ile Ile Ala Ala Ala Arg Glu Pro Ala Val Gly Leu Glu Gln
65 70 75 80

Ala Arg Gln Leu Trp Leu Thr His Glu Leu Phe His Ser Ser Leu Arg
85 90 95

Thr Arg Leu Gly Ala Ile Ile Gly Met Asn Ala Leu Thr Pro Ser Lys
100 105 110

Asn Met Ala Arg Ala Leu Thr His Ile Leu Gly Asp Lys Thr Leu Gly
115 120 125

Asp Leu Lys Arg Lys Val Val Ile Pro Ala Phe Lys Leu Asp Asp Glu
130 135 140

Asn Pro Asp Glu Asn Arg Arg Glu Trp Lys Pro Arg Val Phe His Asn
145 150 155 160

Phe Pro Gly Ala Asp Phe Val Asn Pro Gly Asp Arg Leu Val Asp Leu
165 170 175

Ala Leu Arg Ser Ser Ser Leu Pro Ile Val Ser Pro Val Tyr Gln Gly
180 185 190

Tyr Val Asp Gly Gly Leu Phe Ala Asn Asn Pro Thr Met Ala Ala Val
195 200 205

Ala Gln Ala Ile Tyr Ala Lys Ala Ala Asp Leu Arg Asp Leu Leu Val
210 215 220

Phe Ser Gln Gly Ala Gly Asp Met Val His Tyr Leu Lys Gly Tyr Asn
225 230 235 240

Glu Asn Trp Gly Trp Trp Lys Trp Leu Leu Asn Ser Lys Leu Pro Trp
245 250 255

Ala Leu Val Asp Ile Ala Val Ala Ala Gly Val Glu Ala Ile Asp Phe
260 265 270

Gln Ala Lys Arg Leu Leu Pro Arg Gly Asn Tyr Trp Arg Glu Asp Pro
275 280 285

Arg Val Pro Ser His Leu Gly Asn Ser Val Glu Ala Gln Val Val Thr
290 295 300

Leu Asp Gln Ile Val Glu Lys His Asp Leu Ser Glu Ala Leu Glu Trp
305 310 315 320

Val Asp Ser Ser Gly Trp Leu Pro Lys Gly Met His Glu Ala Ala Ser

325

207
330

335

Gly Ala Gln Pro Glu Leu Ser Gly Glu Ser Gly Glu Ala Arg Ser
340 345 350

<210> 24

<211> 405

<212> PRT

<213> *Angiococcus disciformis*

<400> 24

Met Ala Ala Arg Cys Arg Gln Ala Arg Gly Ala Ser Met Thr Arg Ile
1 5 10 15

Leu Leu Phe Ser Gly Lys Gly Gly Val Gly Lys Thr Thr Ala Ser Ala
20 25 30

Ala Thr Ala Val Ala Ala Ala Lys Arg Gly Tyr Arg Thr Leu Val Met
35 40 45

Ser Phe Asp Ile Ala His Ser Leu Ser Asp Ser Phe Asp Leu Asp Arg
50 55 60

Lys Leu Phe Asp Phe Asn Glu Gly Leu Pro Gln Lys Val Ala Pro Asn
65 70 75 80

Leu Glu Leu Gln Glu Ile Asp Ile Gln His Glu Leu Gln Arg Gln Trp
85 90 95

Ser Glu Val Tyr Asn Tyr Met Ser Val Leu Leu Thr Ser Thr Gly Val
100 105 110

Ser Asn Met Val Ala Glu Glu Val Ala Ile Leu Pro Gly Thr Glu Asp
115 120 125

Val Ile Ser Leu Ile Tyr Leu Asn Gln Tyr Val Gln Gln Gly Arg Tyr
130 135 140

Asp Val Ile Ile Val Asp Cys Pro Pro Thr Gly Glu Ser Leu Arg Phe
145 150 155 160

Val Asn Ile Thr Ser Val Leu Gln Trp Tyr Ile Arg Arg Arg Phe Asn
165 170 175

208

Val Asp Arg Thr Leu Val Lys Leu Ala Arg Pro Leu Ala Ser Arg Leu
180 185 190

Thr Ser Tyr Asp Leu Pro Glu Asp Ser Tyr Phe Ala Ser Leu Glu Gln
195 200 205

Leu Phe Asp Arg Val Lys Gly Ile Glu Gly Leu Leu Thr Asp Gly Asn
210 215 220

Arg Thr Thr Val Arg Leu Val Ser Ser Ala Glu Lys Met Val Ile Arg
225 230 235 240

Glu Thr Gln Arg Ala Tyr Leu Tyr Phe Asn Met Tyr Gly Met Thr Val
245 250 255

Asp Gln Val Val Val Asn Arg Leu Leu Pro Asp Thr Glu Tyr Phe Ala
260 265 270

Gln Trp His Lys Ser Gln Ser Ala Tyr Leu Asp His Ile Gln Glu Tyr
275 280 285

Phe Ser Pro Met Pro Val Ala Arg Leu Pro Leu Leu Glu His Glu Val
290 295 300

Val Gly Leu Glu Arg Leu Glu Asp Leu Ala Gln Arg Leu Tyr Gly Asp
305 310 315 320

Ser Asp Pro Thr Glu Arg Tyr Ile Ser Gly Gln Pro Tyr Gln Phe Ala
325 330 335

Lys Gln His Glu Gly Arg Tyr Arg Leu Gln Leu Leu Met Pro Gly Ala
340 345 350

Asp Arg Gly Asp Ile Val Leu Asp Arg Gln Gly Asn Asp Leu Ile Ile
355 360 365

Arg Val Gly Gly Phe Arg Arg His Val Met Leu Pro Arg Ser Val Ala
370 375 380

Gln Leu Asp Ala Val Asp Ala Val Leu Asp Lys Gly Met Leu Lys Ile
385 390 395 400

Asp Phe Ala Arg Pro
405

<210> 25

<211> 373

<212> PRT

<213> Angiococcus disciformis

<400> 25

Val Asn Ala Val Arg Pro Val Met Gln Leu Lys Gly Ala Gly Ser Ala
1 5 10 15

Met Arg Met Thr Arg Ile Leu Gly Glu Gln Glu Leu Arg Gln Ile Val
20 25 30

Arg Ala Thr Gly Leu His Ala Leu Met Asp Glu Val Ile Ser Thr Leu
35 40 45

Glu Tyr Glu Leu Glu His Phe Asp Pro Ala Asn Thr Glu Leu Arg Lys
50 55 60

Arg Glu Gly Phe Gln Tyr Gln His Pro His Pro Gly Val Leu Glu Trp
65 70 75 80

Met Pro Val Met Gln Val Gly Arg His Ala Val Ile Lys Leu Val Gly
85 90 95

Tyr Asn Pro Arg Ser Pro Glu Glu Leu Gly Leu Pro Thr Ile Leu Ser
100 105 110

Ser Leu Ser Leu Tyr Asp Val Thr Thr Gly His Leu Arg Ala Val Cys
115 120 125

Asp Gly Thr Phe Pro Thr Ala Leu Arg Thr Gly Ala Ala Ser Ala Val
130 135 140

Ala Ser Arg Leu Leu Ala Arg Glu Asp Ser Arg Val Leu Gly Leu Val
145 150 155 160

Gly Cys Gly Ala Gln Ala Val Thr Gln Ala His Ala Leu Ser Arg Val
165 170 175

Phe Pro Leu Gly Arg Val Leu Val His Asp Ile Ala Pro Glu Ala Met
180 185 190

Arg Ser Phe Ala Arg Arg Val Ala Phe Leu Gly Leu Glu Val Val Ala
195 200 205

Val Pro Leu Thr Arg Val Glu Gln Glu Ala Asp Ile Leu Cys Thr Ala

210

210

215

220

Thr Ser Val Ala Val Gly Ala Gly Pro Val Val Ser Gly Arg Leu Ile
 225 230 235 240

Lys Ala His Leu His Ile Asn Ala Val Gly Ser Asp Leu Pro Gly Lys
 245 250 255

Thr Glu Leu Pro Leu Glu Met Leu Arg Arg Ala Leu Val Cys Pro Asp
 260 265 270

Tyr Leu Pro Gln Ala Val Val Glu Gly Glu Cys Gln Gln Leu Glu Pro
 275 280 285

Gly Glu Ile Gly Pro Ser Leu Phe Glu Leu Thr Arg Ser Pro Glu Gln
 290 295 300

Trp Arg Ser His Arg Asp Gly Leu Thr Val Phe Asp Ser Thr Gly Phe
 305 310 315 320

Ser Leu Glu Asp Lys Val Val Leu Glu Val Ile Leu Ala His Ala Glu
 325 330 335

Arg Leu Gly Val Gly Arg Leu Leu Gln Val Glu Ser Met Ala Glu Asp
 340 345 350

Pro Lys Asp Pro Tyr Gly Phe Leu Gln Glu Thr Ala Thr Cys Leu Lys
 355 360 365

Ala Ala Pro Ala Val
 370

<210> 26

<211> 219

<212> PRT

<213> *Angiococcus disciformis*

<400> 26

Met Arg Ile Leu Thr Asp Val Phe Leu Arg Lys Tyr Gln Arg Ala Pro
 1 5 10 15

Gly Pro Arg Glu Arg Ser Leu Ala Ala Asp Ala Arg Ser Lys Leu Trp
 20 25 30

211

Leu Ser Val Gly Leu Thr Ala Phe Leu Val Pro Ala Tyr Ile Glu Tyr
 35 40 45

Phe Cys Arg Met Leu Gly Leu Pro Lys Gly Glu Leu Pro Trp Lys Leu
 50 55 60

Tyr Asp Met Leu Arg Glu Arg Asn Glu Ala Pro Asp Leu Lys Gln Arg
 65 70 75 80

Phe Gln Gln Leu Glu His Leu Pro Glu Gly Ser Phe Gly Arg Glu Phe
 85 90 95

Trp Lys Tyr Cys His Ser His Gly Val Pro Leu Pro Gly His Pro His
 100 105 110

Ala Leu Pro Val His Ser Ala Val His Asp Phe Val His Leu Leu Ser
 115 120 125

Gly Tyr Gly Ile Ser Ile Trp Glu Glu Met Leu Thr Thr Ala Phe Ser
 130 135 140

Leu Gly Phe Met Phe Gly Pro Arg Thr Arg Asn Tyr Asp Pro Ala Gln
 145 150 155 160

Tyr Lys Ser Leu Val Pro Val Arg Leu Leu Ala Glu Ala Leu Pro Ile
 165 170 175

Pro Gln Leu Arg Arg Ala Val Glu Arg Gly Ser Ala Met Ser Val Asp
 180 185 190

Leu Phe Gly Asp Trp Asp Pro Trp Lys Val Met Glu Leu Pro Leu Glu
 195 200 205

Glu Val Lys Arg Met Tyr Asn Ile Gln Pro Glu
 210 215

<210> 27

<211> 781

<212> PRT

<213> *Angiococcus disciformis*

<400> 27

Met Gly His Glu Asp Ser Asp Lys Ala Leu Pro Asp Ser Lys Ala Asn
 1 5 10 15

Glu Val Glu Ser Ser Arg Asn Glu Ala Glu Trp Asn Glu Leu Pro Ile
20 25 30

Ser Ala Arg Asp Cys Glu Asp Leu Lys Lys Ser Cys Leu Leu Pro Ser
35 40 45

Thr Val Arg Lys Leu Gly Trp Arg Thr Asp Thr Asp Glu Asn Asn Arg
50 55 60

Lys Leu Leu Asn Trp Pro Glu Glu Trp Lys Gly Asp Ala Gly Gly Leu
65 70 75 80

Val Leu Val Tyr Pro Gly Leu Asn Tyr Ala Lys Val Lys Pro His Arg
85 90 95

Pro Arg Val Leu Arg Pro Lys Glu Ala Gln Leu Thr Leu Pro Thr Ala
100 105 110

Thr Phe Thr Asp His Ile Leu Arg Pro Tyr Thr Gln Asp Glu Val Glu
115 120 125

Gly Glu Pro Ala Lys Val Lys Lys Tyr Glu Ala Pro Phe Gly Tyr Ala
130 135 140

Pro Gln Ile Phe Asp Thr Ala Ile Leu Cys Pro Met Leu Gln Asp Glu
145 150 155 160

Glu Val Pro Met Ala Leu Ile Glu Gly Glu Lys Lys Ala Ala Leu Leu
165 170 175

Ala Gln Glu Gly Thr Pro Ala Leu Gly Leu Pro Gly Ile Ser Met Ala
180 185 190

His Asp Val Glu Ala Arg Arg Arg Ser Trp Asp Asp Leu Thr Asp Glu
195 200 205

Trp Val Pro His Pro Glu Ala Ala Ser Tyr Leu Ala Gln Gly Arg Thr
210 215 220

Val Phe Val Cys Gly Asp Ala Pro Asp Met Asp Gly Thr Asn Met Asn
225 230 235 240

Val Val Arg Glu Val Val Arg Ile Ala Lys Gly Leu Ser Ala Arg Gly
245 250 255

Cys Asp Pro Gln Ile Pro Tyr Val Asp His Asp Pro Gln His Glu Lys
260 265 270

Ser Gly Val Asp Asp Trp Val His Arg Glu Met Lys Lys Leu Leu Ala
 275 280 285

Ala His His His Lys Thr Glu Ala Trp Ala Arg Gln Phe Leu Ile Val
 290 295 300

Gln Tyr Leu Ala Ser Ala Arg Pro Ala Leu Pro Ser Ala Leu Cys Asp
 305 310 315 320

Trp Leu Val Glu Gln His Glu Ala His Gly Gly Val Lys Glu Ile Glu
 325 330 335

Ile Lys Arg Ala Leu Val Trp Cys Ser Val Trp Phe Ser Thr Glu His
 340 345 350

Gly Ile Phe Lys Lys Trp Val Gly Thr Leu Lys Arg Lys Lys Val Cys
 355 360 365

Lys Pro Glu Val Ile Asp Arg Leu Val Gln Ala Leu Pro Arg Val Glu
 370 375 380

Asn Arg Phe Glu Pro Arg Thr Trp Val Gln His Trp Met Glu Lys Asn
 385 390 395 400

Gly Val Thr Phe Val Tyr Ala Ser Asp Gly Phe Gln Ile Gly Gly Arg
 405 410 415

Met Phe Pro Ala Ser Glu Phe Leu Ser Gln Ile Glu Ile Glu Ser Thr
 420 425 430

Asn Glu Arg Thr Cys Ile Ser Val Arg Asn Leu Gly Asn Ala Val Arg
 435 440 445

Leu Trp Glu Ala Asp Gln Arg Arg Gly Ile Val Glu Gln Tyr Arg Glu
 450 455 460

Lys Leu Lys Phe Arg Glu Asp Gly Arg Arg Gly Asp Ala Glu Glu Phe
 465 470 475 480

Ile Arg Ala Thr Thr Gly Arg Leu Asp Pro Val Asp Leu Val Val Val
 485 490 495

Leu His Phe Ile Trp Gln Val Lys Arg Lys Leu Phe Gly Lys Pro Val
 500 505 510

Lys Asp His Leu Met Pro Ile Phe Val Gly Lys Gln Arg Gly Gly Lys

515

520

525

Thr Thr Ala Ile Lys Ser Leu Leu Gln Pro Leu Gly Asp Leu Val Gly
530 535 540

Phe Pro Ala Asp Leu Gln Phe Leu Thr Asp Glu Arg Gln Gln Phe Arg
545 550 555 560

Leu Thr Arg Cys Tyr Gly Met Phe Phe Asp Glu Met Ala Lys Ala Glu
565 570 575

Arg Val Ala Ser Asp Val Leu Lys Asn Arg Ile Thr Ala Glu Arg Ile
580 585 590

Glu Tyr Arg Val Leu Gly Val Gln Lys Leu Gln Thr Gly Thr Asn Asn
595 600 605

Ala Thr Phe Ile Gly Ala Ser Asn Lys Gln Val Lys Glu Ile Val Val
610 615 620

Asp Pro Thr Gly Met Arg Arg Phe Tyr Gln Leu Asp Cys Leu Pro Gln
625 630 635 640

Met Asn Trp Thr Ala Leu Glu Gln Ile Asp Phe Leu Ala Met Trp Thr
645 650 655

Ser Val Asp Glu Lys Ala Glu Ser Pro Leu Leu Gly Gln Leu Ala Gln
660 665 670

Val Gln Ala Arg Gln Asp Glu Ile Arg Ala Lys Asp Ser Val Glu Asp
675 680 685

Phe Phe Glu Arg Arg Cys Ala Gln Arg Asp Gln Trp Ile Lys Ala Thr
690 695 700

Ala Leu Tyr Gly His Tyr Val Glu Asp Leu Lys Tyr Gln Gly Arg Asp
705 710 715 720

Arg Met Ala Phe Ser Leu Thr Lys Phe Gly Glu Arg Met Lys Glu Leu
725 730 735

Ala Gly Glu Glu Asn Thr Gly Trp Lys Arg Ser Asp Gly Ile Lys Tyr
740 745 750

Arg Val Thr Val Lys Arg Trp Glu Thr Glu Ile Asp Gly Val Met Glu
755 760 765

215

Ser Ile Ala Ala Gly Ala Arg Met Asp Leu Ala His Pro
 770 775 780

<210> 28

<211> 332

<212> PRT

<213> *Angiococcus disciformis*

<400> 28

Met Asp Thr Asp Lys Val Ala Leu Phe Gly Ala Ser Gly Pro Ile Gly
 1 5 10 15

His Ser Ile Val Lys Ala Leu Arg Glu Gln Gly Arg Ala Tyr Arg Val
 20 25 30

Val Gly Arg Ser Arg Ala Ser Leu Gln Ser Gln Phe Gly Ala Asp Pro
 35 40 45

Lys Ala Glu Ile Ala Thr Trp Asn Pro Asp Ala Pro Asp Thr Ile Arg
 50 55 60

Ala Ala Ala Arg Gly Ile Arg Thr Leu Ile Tyr Met Val Gly Val Asp
 65 70 75 80

Tyr Trp Arg Phe Gln Leu His Pro Glu Leu Met Arg Arg Thr Val Asp
 85 90 95

Ala Ala Ile Ala Glu Gly Val Glu Arg Val Val Leu Ile Gly Thr Val
 100 105 110

Tyr Pro Tyr Gly Arg Pro Arg Thr Thr Pro Val Thr Glu Asp His Pro
 115 120 125

Arg Glu Pro His Thr Phe Lys Gly Arg Met Arg Lys Glu Gln Glu Asp
 130 135 140

Ile Leu Leu Ala Ala Asp Ala Ala Gly Lys Leu Arg Ala Thr Ile Leu
 145 150 155 160

Arg Leu Pro Asp Phe Tyr Gly Pro Gly Ile Asp Lys Ser Phe Leu His
 165 170 175

Ser Ala Phe Val Ala Ala Ala Gln Gly Lys Arg Ala Gln Leu Ile Gly
 180 185 190

Pro Ile Asp Pro Pro His Glu Tyr Val Tyr Val Pro Asp Val Gly Pro
 195 200 205

Thr Val Thr Ala Leu Met Asp Ala Pro Gly Ala Tyr Gly Arg Trp Trp
 210 215 220

Asn Leu Ala Gly Ala Gly Val Thr Ser Gln Arg Lys Leu Val Glu Glu
 225 230 235 240

Ile Tyr Ala Gln Ala Gly His Leu Ala Lys Phe Met Thr Ala Gly Lys
 245 250 255

Gly Met Leu Arg Leu Ile Gly Leu Phe Asn Pro Phe Met Arg Glu Met
 260 265 270

Val Glu Met His Tyr Leu Leu Thr Glu Pro Val Leu Met Asp Asp Ser
 275 280 285

Ala Leu His Lys Leu Leu Gly Ser Val Arg Lys Thr Pro Tyr Ser Glu
 290 295 300

Gly Ile Arg Gln Thr Leu Glu Ala Thr Arg Ala Ser Leu Val Ser Pro
 305 310 315 320

Ala Pro Ala Ala Thr Gly Arg Pro His Pro Ala Pro
 325 330

<210> 29

<211> 547

<212> PRT

<213> Angiococcus disciformis

<400> 29

Met Ala Ala Lys Glu Ile Phe Phe His Gln Ser Ala Arg Glu Ala Ile
 1 5 10 15

Leu Arg Gly Val Arg Thr Leu Ala Asp Ala Val Ala Val Thr Leu Gly
 20 25 30

Pro Lys Gly Arg Asn Val Val Ile Glu Lys Ser Phe Gly Ser Pro Thr
 35 40 45

Ile Thr Lys Asp Gly Val Thr Val Ala Lys Glu Ile Asp Leu Asp Asn
 50 55 60

Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Lys
 65 70 75 80

Thr Ser Asp Lys Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala
 85 90 95

Arg Ala Ile Tyr Glu Glu Gly Leu Lys Leu Val Ala Ala Gly His Ser
 100 105 110

Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Val Glu Val Val Val
 115 120 125

Glu Glu Leu Lys Lys Leu Ser Lys Pro Thr Ala Asp Lys Lys Ala Ile
 130 135 140

Thr Gln Val Gly Thr Ile Ser Ala Asn Gly Asp Glu Thr Ile Gly Ser
 145 150 155 160

Ile Ile Ala Asp Ala Met Glu Lys Val Gly Lys Glu Gly Val Ile Thr
 165 170 175

Val Glu Glu Ala Lys Gly Leu Glu Thr Asn Leu Asp Val Val Glu Gly
 180 185 190

Met Gln Phe Asp Arg Gly Tyr Val Ser Pro Tyr Phe Val Thr Asn Arg
 195 200 205

Glu Arg Met Glu Val Val Met Asp Asp Pro Phe Ile Leu Ile Ser Glu
 210 215 220

Lys Lys Val Ser Ser Met Gln Asp Met Ile Pro Ile Leu Glu Gln Val
 225 230 235 240

Ala Arg Ser Gly Lys Pro Leu Leu Ile Ile Ala Asp Asp Ile Glu Gly
 245 250 255

Glu Ala Leu Ala Thr Leu Val Val Asn Lys Ile Arg Gly Val Leu Asn
 260 265 270

Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Glu Met
 275 280 285

Leu Lys Asp Ile Ala Thr Leu Thr Gly Gly Met Val Val Ser Glu Glu
 290 295 300

Leu Gly His Lys Tyr Glu Asn Leu Thr Leu Asn Asp Leu Gly Arg Ser

305

310

315

320

Lys Arg Ile Thr Val Asp Lys Asp Asn Thr Thr Ile Val Asp Gly Ala
325 330 335

Gly Thr Lys Ser Glu Ile Glu Gly Arg Ile Lys Leu Ile Arg Ser Gln
340 345 350

Ile Asp Thr Val Thr Ser Asp Tyr Asp Arg Glu Lys Leu Gln Glu Arg
355 360 365

Leu Ala Lys Leu Val Gly Gly Val Ala Val Ile Asn Val Gly Ala Ala
370 375 380

Thr Glu Thr Glu Met Lys Glu Lys Lys Ala Arg Val Glu Asp Ala Leu
385 390 395 400

His Ala Thr Arg Ala Ala Val Glu Glu Gly Ile Val Pro Gly Gly Gly
405 410 415

Val Ala Phe Leu Arg Cys Leu Pro Ala Leu Glu Lys Leu Lys Leu Gly
420 425 430

Gly Glu Gln Asp Phe Gly Val Glu Ile Ile Arg Arg Ala Leu Gln Glu
435 440 445

Pro Leu Arg Lys Ile Ala Ser Asn Ala Gly Val Glu Gly Ala Val Val
450 455 460

Ile Asn Lys Val Arg Glu Gly Gln Gly Ala Phe Gly Tyr Asn Ala Arg
465 470 475 480

Thr Glu Val Tyr Glu Asp Leu Glu Lys Ala Gly Val Ile Asp Pro Thr
485 490 495

Lys Val Glu Arg Thr Ala Leu Gln Asn Ala Ala Ser Val Ala Ser Leu
500 505 510

Leu Leu Thr Thr Glu Ala Met Ile Ala Asp Arg Pro Ala Lys Lys Lys
515 520 525

Gly Lys Asn Gly Gly Gly Ala Gly Met Pro Asp Tyr Gly Gly Asp Asp
530 535 540

Met Asp Tyr
545

<210> 30

<211> 746

<212> PRT

<213> Angiococcus disciformis

<400> 30

Val Thr Arg Arg Cys Arg Cys Pro Ser Cys Pro Pro Arg Ala Gly Gly
1 5 10 15

Ala Cys Ser Val Ala Trp Pro Ala Pro Tyr Arg Ala Arg Pro Arg Ala
20 25 30

Pro His Ser Phe Arg His Pro Pro Cys Pro Arg Arg Pro Leu Pro His
35 40 45

Pro Cys Pro His Arg Ser Arg Ser His His Pro Ala Pro Cys Leu Arg
50 55 60

Pro Pro Ser Gly Pro Arg Pro Leu Arg Pro Ser Arg Ser Pro Pro Ser
65 70 75 80

Arg Pro Arg Pro Ala Ala Pro Ser Ala Gly Ala Cys Pro Arg Asn Arg
85 90 95

Pro Pro Arg Arg Ala Gly Arg Thr Gly Ala Arg Val Ser Trp Asp Leu
100 105 110

Ser Leu Glu Gly Ala Ala Gln Leu Thr Ala Glu Arg Arg Gly Ile Gly
115 120 125

Gln Gln Leu Arg Lys Ala Arg Gly Gly Thr Gly Ala Gln Arg Leu Gln
130 135 140

Arg Arg Leu His Gly Glu Val Leu Gly Gln His Asp Glu Gly Gly Ala
145 150 155 160

Leu Gly Gln Arg Leu Gly Gln Leu Gln Arg Leu Ala Pro Ile Gly Arg
165 170 175

Arg Glu Val Pro Ala His His His Ala His Arg Arg Arg His Arg His
180 185 190

Gln Leu Arg Arg Gly Gln His Pro Arg Leu Gln Pro Gln His Val Gln
195 200 205

Gly Leu Gly Asp Glu Pro Arg Arg Arg Arg Val Val Leu Gln His Val
210 215 220

His Pro Pro His Phe Gly Pro Gly Gly His His Arg Arg His Arg Arg
225 230 235 240

Leu Arg Gly Gln Arg Arg Ala Gln Gln Pro Ala His Leu Pro Asp Val
245 250 255

Val Glu Gly Leu Glu Gln Val Val His His Ala Gln Leu Gln Arg Leu
260 265 270

Leu Arg Arg His Gln Arg Arg Val Ala Arg His Gln Asp Asp Ala Arg
275 280 285

Val Gly Val Glu Pro Pro Arg Leu Leu Arg Gln Leu Gln Pro Gly Gln
290 295 300

Ala Arg Gln Val Leu Val Arg Asp Asp Glu Val His Trp Arg Leu Ala
305 310 315 320

Gln Gln Ile Gln Arg Phe Leu Ala Ala Gly Arg Leu Asp Asp Leu Ala
325 330 335

Leu Leu Ala His Gln Val Ala Glu Asp His Ala Asp Asp Gly Leu Val
340 345 350

Val His His Gln Gln Pro Leu Ala Gln Leu Arg Arg Arg Val Arg Gly
355 360 365

Gly Glu Glu Tyr Pro Glu His Gly Gly Arg Arg Gly His Val Ala Asn
370 375 380

Gly Ala Arg Arg Arg Glu Ala Asn Arg Arg Val Val Leu Leu Gly Asp
385 390 395 400

Ala Leu Ala His Arg Gln Pro Gln Ser Arg Ala Ala Leu Val Gly Gly
405 410 415

Asp Val Gly Leu Glu Asp Ala Leu Ala Gln Leu His Gly Asp Ala Arg
420 425 430

Ala Pro Val Arg His Val Gln His Arg Arg Gly Ala Leu Ala Arg Glu
435 440 445

His His Leu His Ala Pro Ala Ala Gly His Gly Val Ala Arg Val Val
450 455 460

Gln Gln Val Gln Arg Glu Leu Leu Asp Glu Pro Arg Val Ala Leu Asp
465 470 475 480

Gly Asp Val Leu Gly Arg Leu His Leu Gln Arg His Ala Arg Arg Val
485 490 495

Arg Val Asp Ala Glu Gln Leu Arg Arg Arg Pro Asp Gly Arg Arg Gln
500 505 510

Arg Gln Ala Leu Leu Arg Arg Val Pro Leu Ala Gly Glu Ala Asp Val
515 520 525

Val Gly Asp Asp Leu Phe His Pro Leu His Leu Arg Gln Gln Gln Pro
530 535 540

Gln Arg Ala Gly Gly Ala Thr Val Leu Arg Glu Gln Leu Arg Val Gly
545 550 555 560

Leu His Ala Gln Gln Gly Leu Pro Gln Leu Val Gln His Leu Arg Arg
565 570 575

Gln Leu Cys Arg Val Arg Ala Arg Thr Leu Gln Ser Arg Arg Arg Arg
580 585 590

Ala Arg Gly Arg Gln Ile Ser Arg Leu Gln Gly Leu Glu Gln Leu Gly
595 600 605

Glu Arg Arg Gly Cys Phe His Gly Pro Ser Met Ala Glu Ala Ala Val
610 615 620

Ser Thr Gln Arg Gly Arg Arg Asp Ser Val Asp Pro Gly Pro Trp Pro
625 630 635 640

Arg Gly Cys Ser Ser Arg Pro Leu Ala Pro Arg Pro Glu Arg Gly Arg
645 650 655

His His Arg Pro Arg Glu Gly Leu His Ala Ala Asp Gln Pro Val Pro
660 665 670

Leu Ala Gly Ala Pro Glu Asp Asp Arg Leu Arg Ala Gly Pro Leu His
675 680 685

Pro Ala Glu His Arg Gly Gly Ala Gly Arg His Gln Pro Leu Arg Arg
690 695 700

Pro His Arg Cys His Arg Gln Arg Gly Gly Gln Gly His Pro Pro Ser

705

710

715

720

Arg His Gly Arg Gly Ala Arg Ala Arg Arg Pro Leu Leu Ala Ala Asp
725 730 735

Cys Pro Val Gly Pro Arg Ala Gly Pro Ala
740 745

<210> 31

<211> 417

<212> PRT

<213> Angiococcus disciformis

<400> 31

Val Thr Ala Val Asp Asn Gly Leu Asp Ala Ile Ser Arg Thr Arg Glu
1 5 10 15

Leu Arg Pro Asp Val Val Leu Ala Asp Val Met Met Pro Gly Lys Ser
20 25 30

Gly Tyr Glu Val Cys Glu Ala Leu Lys Ser Asp Pro Ala Thr Gln Gly
35 40 45

Ile Pro Val Val Leu Leu Ala Gly Thr Phe Glu Ala Phe Asp Glu Asn
50 55 60

Arg Ala Arg Ala Ala Arg Ala Asp Asp His Ile Ala Lys Pro Phe Glu
65 70 75 80

Ser Gln Val Leu Leu Asp Lys Val Lys Ala Leu Val Gly Gln Lys Ser
85 90 95

Asn Thr Met Pro Ala Ser Ala Ala Thr Gln Val Arg Pro Pro Thr Ala
100 105 110

Gln Pro Ala Thr Pro Ala Pro Val Pro Pro Gly Pro Gln Pro Gly Ala
115 120 125

Pro Thr Ala Ala Arg Pro Gly Ile Pro Gln Gly Thr Gln Pro Gly Val
130 135 140

Pro Arg Pro Pro Gly Pro Gly Met Pro Pro Gly Ala Pro Gly Ala Pro
145 150 155 160

223

Arg Pro Pro Gly Pro Gly Met Pro Pro Gly Pro Gly Met Ala Arg Pro
 165 170 175

Pro Gly Pro Gly Met Pro Pro Pro Gly Ala Pro Gly Ala Pro Arg Pro
 180 185 190

Pro Gly Pro Gly Met Pro Pro Gly Pro Gly Met Ala Arg Pro Pro Gly
 195 200 205

Pro Gly Met Pro Pro Pro Gly Ala Pro Gly Ala Pro Arg Pro Pro Gly
 210 215 220

Pro Gly Met Pro Pro Pro Gly Ala Ala Ala Arg Pro Gly Arg Ala Ala
 225 230 235 240

Ser Ala Gly Cys Val Arg Ala Gly His Ala Ala Ala Ser Gly Arg Ala
 245 250 255

Arg Ala Ser Gly Trp Ala Gly Ala Gly Met Ala Arg Pro Gly Ile Pro
 260 265 270

Gln Gly Ser Gln Pro Gly Phe Pro Arg Pro Pro Gly Gly Ala Ala Pro
 275 280 285

Leu Pro Pro Ala Pro Gly Gly Ala Thr Gln Pro Ala Ala Arg Ala Arg
 290 295 300

Asp Pro Phe Gly Leu Gly Ala Pro Thr Ala Ala Pro Gln Ala Ala Gln
 305 310 315 320

Pro Ser Ile Ser Ile Glu Asp Ser Leu Pro Glu Pro Ser Gly Ala Glu
 325 330 335

Glu Ile Ser Leu Asp Met Gly Gly Pro Pro Thr Ala Ala Pro Thr Ala
 340 345 350

Val Ala Pro Thr Ala Ala Pro Ala Thr Ala Arg Pro Thr Ala Ala Asp
 355 360 365

Gly Gly Glu Ala Leu Leu Arg Glu Ala Leu Ser Lys Ala Ser Arg Glu
 370 375 380

Val Ile Glu Lys Ile Ala Trp Glu Val Val Pro Gln Leu Ala Glu Thr
 385 390 395 400

Ile Ile Arg Glu Glu Leu Glu Arg Leu Ile Lys Asp Arg Glu Thr Gln
 405 410 415

His

<210> 32

<211> 1102

<212> PRT

<213> Angiococcus disciformis

<400> 32

Met Glu Arg Asn Tyr Phe Arg Ala Glu Ala Thr Ser Asp Lys Pro Ala
1 5 10 15

Phe Ser Ile Val Leu Pro Pro Pro Asn Val Thr Gly Ser Leu His Ile
20 25 30

Gly His Ala Leu Thr Ala Thr Ile Gln Asp Ile Leu Ala Arg Trp Lys
35 40 45

Arg Met Ser Gly Phe Asn Thr Leu Trp Leu Pro Gly Thr Asp His Ala
50 55 60

Gly Ile Ala Thr Gln Met Val Val Glu Lys Glu Leu Lys Lys Thr Glu
65 70 75 80

Gly Lys Ser Arg His Asp Leu Gly Arg Ala Ala Phe Leu Glu Arg Val
85 90 95

Trp Glu Trp Lys Gly Lys Tyr Gly Ala Arg Ile Gly Glu Gln His Arg
100 105 110

Phe Leu Gly Ala Ser Leu Asp Trp Ser Arg Glu Arg Phe Thr Met Asp
115 120 125

Glu Gln Ser Ser Ala Ala Val Arg Glu Val Phe Val Arg Leu Tyr Glu
130 135 140

Glu Gly Leu Met Tyr Arg Ala Gln Lys Leu Ile Asn Trp Cys Pro Ser
145 150 155 160

Cys Arg Thr Ala Leu Ser Asp Leu Glu Val Glu His Glu Glu Ser Lys
165 170 175

Lys Gly Ser Ile Trp His Ile Arg Tyr Pro Val Lys Asp Ser Asp Arg
180 185 190

Thr Leu Thr Val Ala Thr Thr Arg Pro Glu Thr Met Leu Gly Asp Thr
 195 200 205

Ala Val Ala Ile His Pro Glu Asp Glu Arg Tyr Leu Gly Leu Ala Gly
 210 215 220

Lys Ser Val Lys Leu Pro Leu Thr Asp Arg Glu Ile Pro Ile Ile Ala
 225 230 235 240

Asp Ala Glu Leu Val Asp Pro Lys Phe Gly Thr Gly Val Val Lys Val
 245 250 255

Thr Pro Ala His Asp Phe Asn Asp Tyr Gln Thr Gly Leu Arg His Lys
 260 265 270

Leu Pro Met Leu Thr Ile Leu Asp Glu Ala Ala Arg Met Thr Lys Glu
 275 280 285

Thr Gly Lys Tyr Ala Gly Met Asp Arg Phe Glu Ala Arg Lys Gln Val
 290 295 300

Leu Ala Asp Leu Thr Glu Gln Gly Leu Leu Glu Lys Glu Glu Pro His
 305 310 315 320

Met Leu Asn Val Gly Thr Cys Gln Arg Cys Ala Thr Val Val Glu Pro
 325 330 335

Arg Leu Ser Pro Gln Trp Phe Ile Lys Ile Glu Pro Leu Ala Lys Pro
 340 345 350

Ala Ile Glu Ala Val Glu Gln Gly Arg Thr Lys Phe Val Pro Glu Ser
 355 360 365

Trp Thr Asn Thr Phe Phe His Trp Met Arg Asn Ile His Asp Trp Cys
 370 375 380

Val Ser Arg Gln Leu Trp Trp Gly His Gln Ile Pro Ala Tyr Tyr Cys
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Thr Ser Cys Ser Pro Arg Gln Gly Asp Asp Thr Asp Leu Pro Leu Asp
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Ala Pro Thr Val Lys Val Gly Gly Val Asp Phe Ala Arg Ala Glu Pro
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Ile Val Ala Arg Glu Gln Pro Lys Ser Cys Pro Lys Cys Gly Gly Ala

435

440

445

Ser Phe Ile Gln Asp Pro Asp Val Leu Asp Thr Trp Phe Ser Ser Gly
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Phe Thr Leu Ala Ser Leu Thr Gln Gln Gly Arg Asp Ile Lys Leu Ser
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Tyr Ser Phe Gly Glu Ala Ala Ser Thr Leu Tyr Gln Phe Leu Trp Ala
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Glu Phe Cys Asp Trp Tyr Ile Glu Leu Ala Lys Gly Ser Leu Tyr Gly
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227

Glu Asp Ala Ala Ala Lys Asp Ser Thr Arg Arg Val Leu Val Tyr Cys
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Leu Asp Arg Ile Leu Arg Leu Leu His Pro Phe Met Pro Phe Ile Thr
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Glu Glu Ile Trp Gln Lys Leu Pro Met Ala Arg Pro Thr Asp Ser Ile
725 730 735

Met Ile Ala Pro Tyr Pro Glu Pro Asp Ala Ala His Val Asp Glu Ala
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Ala Glu Gly Glu Met Ala Pro Val Ile Ala Ala Ile Glu Gly Leu Arg
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Thr Ile Arg Gly Glu Ser Asn Leu Ser Pro Ala Thr Lys Val Lys Ala
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Val Val Gln Ser Ala Asp Val Arg Thr Arg Glu Leu Leu Glu Arg Trp
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Pro Asp Val Val Glu Lys Asp Arg Ala Arg Val Glu Glu Leu Lys Glu
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Glu Leu Lys Gly Glu Leu Gly Glu Thr Gly Thr Ala Ser Glu Ala Gly
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Glu Gly Leu Ser Pro Ser Asp His His Asp Leu Gly Val Ala Tyr Met
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Leu Trp Val Glu Gly Glu Arg Leu Arg Phe Gln Ala Pro Pro Gly Val	
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Met Thr Pro Glu Leu Gln Ser Arg Leu Gly Gly Ala Arg His Glu Leu	
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Ile Ala Leu Leu Arg Gln Leu Gln Pro Ser Ser Gln Gly Gly Ser Leu	
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Gln Arg Leu Trp Phe Gln Glu Gln Leu His Pro Glu Ala Pro Ala Asn	
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Asn Leu Thr Gly Ala Val Val Phe Thr Gly Pro Leu His Val Ala Ala	
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Leu Leu Gly Ala Val Ala Ala Leu Val Arg Arg His Glu Ala Leu Arg	
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ccc cac ggg ctg aag ctg gag ggg gtg caa gcg cag ccg ctc gac ttt Gly His Gly Leu Lys Leu Glu Gly Val Gln Ala Gln Pro Leu Asp Phe 435 440 445			1344
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Pro Leu Pro Phe Ala Pro Gln Gly Cys Ala Thr Leu Asp Leu Gln Ala	
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Pro Lys Gly Val Ala Val Cys His Arg Ala Met Thr Arg Leu Val Cys	
690 695 700	

232

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Asn Thr Asp Tyr Val Gln Leu Gly Pro Glu Asp Arg Val Ala Gln Ala	
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Phe Val Thr Thr Ala Leu Phe Asn His Val Ala Arg Glu Gln Pro Gln	
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Gln Asn 1475	Pro Leu Val Gln 1480	Val Leu Leu Ala Leu 1485	Gln Asn Ala Pro 1485	
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Ser Glu 1595	Val Ala Arg Arg 1600	Gln Pro Gly Ala Thr 1605	Ala Val Thr Gln 1605	
ggc ggg 1610	cgg cac ctc acc 1615	tat gca gag ctg gag 1620	gag cgc tcg gaa 1620	4869
Gly Gly 1610	Arg His Leu Thr 1615	Tyr Ala Glu Leu Glu 1620	Glu Arg Ser Glu 1620	
cgc ctg 1625	gcc cgc tac ctg 1630	gcc tgg ctg ggc gtg 1635	cgc gcg ggc gac 1635	4914
Arg Leu 1625	Ala Arg Tyr Leu 1630	Ala Trp Leu Gly Val 1635	Arg Ala Gly Asp 1635	
aga gtg 1640	ggg ttg gcc acc 1645	gag cgc acg ctg gag 1650	cgg atc atc agc 1650	4959
Arg Val 1640	Gly Leu Ala Thr 1645	Glu Arg Thr Leu Glu 1650	Arg Ile Ile Ser 1650	
ctg cta 1655	ggc atc ctc aag 1660	gcg gga gcc gcc tac 1665	gta ccg ctg gat 1665	5004
Leu Leu 1655	Gly Ile Leu Lys 1660	Ala Gly Ala Ala Tyr 1665	Val Pro Leu Asp 1665	

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gtg cgc	cag cca	gcg cgt	cgg	ctg agc	ctg	gtg	cag gcc	gcg	5049
Val Arg	Gln Pro	Ala Arg	Arg	Leu Ser	Leu	Val	Gln Ala	Ala	
1670			1675			1680			
ggc gtg	cgc acc	gtc atc	gcc	gag gag	cag gct	cgc	acg gtg	ctg	5094
Gly Val	Arg Thr	Val Ile	Ala	Glu Glu	Gln Ala	Arg	Thr Val	Leu	
1685			1690			1695			
tca ggc	ctg ggg	cag cca	ctg	acc ctg	gtc gat	gcc	gcc cag	gag	5139
Ser Gly	Leu Gly	Gln Pro	Leu	Thr Leu	Val Asp	Ala	Ala Gln	Glu	
1700			1705			1710			
ccg gcc	tcc gcg	cag cag	gtc	ccc gcg	ctc ggg	ccg	gag cgc	tcg	5184
Pro Ala	Ser Ala	Gln Gln	Val	Pro Ala	Leu Gly	Pro	Glu Arg	Ser	
1715			1720			1725			
ctg ggc	ggg gac	atg ctc	gcc	tac gtg	ctt ttc	acc	tcg ggc	tcc	5229
Leu Gly	Gly Asp	Met Leu	Ala	Tyr Val	Leu Phe	Thr	Ser Gly	Ser	
1730			1735			1740			
acc ggc	gag ccc	aag ggc	gtc	tgc att	ccc cac	cgt	gcc gtg	ctg	5274
Thr Gly	Glu Pro	Lys Gly	Val	Cys Ile	Pro His	Arg	Ala Val	Leu	
1745			1750			1755			
cgg ctg	atc cat	gag ccc	tcc	tac gtc	cag ctc	tcg	ccg cgg	gag	5319
Arg Leu	Ile His	Glu Pro	Ser	Tyr Val	Gln Leu	Ser	Pro Arg	Glu	
1760			1765			1770			
gtc atg	ctg cac	tac gca	ccg	ctg gag	ttc gat	gcc	tcc acc	ttc	5364
Val Met	Leu His	Tyr Ala	Pro	Leu Glu	Phe Asp	Ala	Ser Thr	Phe	
1775			1780			1785			
gag gtc	tgg ggg	gcg ctg	ctc	aac ggg	gca agg	ctc	gtg ctg	gtc	5409
Glu Val	Trp Gly	Ala Leu	Leu	Asn Gly	Ala Arg	Leu	Val Leu	Val	
1790			1795			1800			
cct ccg	gaa cag	cag tcc	ctc	gag agc	ctg gga	cag	gag ctg	agc	5454
Pro Pro	Glu Gln	Gln Ser	Leu	Glu Ser	Leu Gly	Gln	Glu Leu	Ser	
1805			1810			1815			
acc cag	ggc gtc	acc gtg	ctg	tgg ctc	acc gcc	ggg	ctc ttc	cgg	5499
Thr Gln	Gly Val	Thr Val	Leu	Trp Leu	Thr Ala	Gly	Leu Phe	Arg	
1820			1825			1830			
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Leu Met	Val Glu	Glu Gln	Leu	Lys Ser	Leu Arg	Gly	Val Arg	Gln	
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Leu Leu	Ala Gly	Gly Asp	Val	Leu Pro	Met Pro	Gln	Val Arg	Arg	
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Leu Arg	Glu Ala	Leu Pro	Glu	Cys Gln	Leu Ile	Asn	Gly Tyr	Gly	
1865			1870			1875			
ccc acc	gag agc	tgc acc	ttc	acc tgc	tgt cac	cgc	gtg ggc	agc	5679
Pro Thr	Glu Ser	Cys Thr	Phe	Thr Cys	Cys His	Arg	Val Gly	Ser	
1880			1885			1890			
ccc cag	gag ctg	ggc ggc	tcc	gtg ccc	atc ggc	acc	ccc atc	gac	5724
Pro Gln	Glu Leu	Gly Gly	Ser	Val Pro	Ile Gly	Thr	Pro Ile	Asp	
1895			1900			1905			

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ccg ggc gag gtg gag gcc gcg gtg ctc acc cac ccg gcg gtg cag Pro Gly Glu Val Glu Ala Ala Val Leu Thr His Pro Ala Val Gln 2000 2005 2010	6039
tcc gcg gtg gtg gtg ggg cgc gag ggc ccc ggc ggc aag gag ctg Ser Ala Val Val Val Gly Arg Glu Gly Pro Gly Gly Lys Glu Leu 2015 2020 2025	6084
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cag cag gag cag cgg ctg gta cac gag tgg gag tcc gtg ttc gac Gln Gln Glu Gln Arg Leu Val His Glu Trp Glu Ser Val Phe Asp 2045 2050 2055	6174
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ggc acg gat ttc tcc ccg gcg gcg ttg gac tac gtg cgt cgc tac Gly Thr Asp Phe Ser Pro Ala Ala Leu Asp Tyr Val Arg Arg Tyr 2140 2145 2150	6444

2135	2140	2145	
ctc ccc ccg gag cac ccg ggc cgc gtg gag ctg cta cac cgc acg Leu Pro Pro Glu His Pro Gly Arg Val Glu Leu Leu His Arg Thr 2150 2155 2160			6489
gcg gac gag tgg agc ggc gtg gcg gcc ggc tcc ttc gac gcg gtg Ala Asp Glu Trp Ser Gly Val Ala Ala Gly Ser Phe Asp Ala Val 2165 2170 2175			6534
ctg ctc aat tcg gtg gtg cag tac ttc ccc tcg cag gag tac ctg Leu Leu Asn Ser Val Val Gln Tyr Phe Pro Ser Gln Glu Tyr Leu 2180 2185 2190			6579
cgg cag gtg ctg gcc cgc tgc gtg gag gcc gtg gag gac ggg ggc Arg Gln Val Leu Ala Arg Cys Val Glu Ala Val Glu Asp Gly Gly 2195 2200 2205			6624
ttc gtc ttc gtg ggg gat gtg cgg agc ttg ccg ctg ctg gag tcc Phe Val Phe Val Gly Asp Val Arg Ser Leu Pro Leu Leu Glu Ser 2210 2215 2220			6669
ttc cac gcc tcg gtg gag ctg gag cgg gcc gcc ccc tcc atg ccg Phe His Ala Ser Val Glu Leu Glu Arg Ala Ala Pro Ser Met Pro 2225 2230 2235			6714
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aac gag ctg gtg gtg gac ccg gca ctc ttc gtg gcg ctg gcc cat Asn Glu Leu Val Val Asp Pro Ala Leu Phe Val Ala Leu Ala His 2255 2260 2265			6804
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cac atc ggg ccg cgc acg ccg cca ccg gcc tcc gag gtg ccg tgg His Ile Gly Pro Arg Thr Pro Pro Pro Ala Ser Glu Val Pro Trp 2300 2305 2310			6939
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cgg ctc cgg cag ggc ccg cca ggg cca ctg ggg gtg gca ggc att Arg Leu Arg Gln Gly Pro Pro Gly Pro Leu Gly Val Ala Gly Ile 2330 2335 2340			7029
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ggc agc aca ggc agc gcg cgg cgg gtg gag gag ctg cgc cgg cgc Gly Ser Thr Gly Ser Ala Arg Arg Val Glu Glu Leu Arg Arg Arg 2360 2365 2370			7119
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Gln	Leu	Ala	Glu	Ser	Leu	Gly	Tyr	Thr	Ala	Ala	Val	Ser	Trp	Ser	
2390						2395					2400				
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Pro	Gly	Arg	Arg	Asp	Gly	Ala	Phe	Asp	Val	Leu	Phe	Leu	Pro	Ala	
2405						2410					2415				
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Thr	Pro	Gly	Met	His	Pro	Arg	Trp	Leu	Gly	Pro	Thr	Pro	Leu	Asn	
2420						2425					2430				
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Arg	Thr	Pro	Pro	Pro	Ala	Ser	Ala	Arg	Leu	Ser	Ser	Glu	Pro	Arg	
2435						2440					2445				
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Arg	Ala	Ser	Leu	Ser	Leu	Arg	Leu	Gly	Ser	Ala	Leu	Arg	Ala	His	
2450						2455					2460				
ctg	cag	acc	cat	cta	cca	gac	ttc	atg	gtg	ccc	tca	cgc	ttc	gtg	7434
Leu	Gln	Thr	His	Leu	Pro	Asp	Phe	Met	Val	Pro	Ser	Arg	Phe	Val	
2465						2470					2475				
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Val	Leu	Gln	Ser	Leu	Pro	Leu	Thr	Pro	Asn	Gly	Lys	Val	Asp	Arg	
2480						2485					2490				
gcg	gcc	ttg	ccc	gtc	ccc	gac	tcg	cgt	cgg	ctg	gaa	tct	gcc	ccg	7524
Ala	Ala	Leu	Pro	Val	Pro	Asp	Ser	Arg	Arg	Leu	Glu	Ser	Ala	Pro	
2495						2500					2505				
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Trp	Lys	Glu	Val	Leu	Gly	Leu	Glu	Glu	Val	Ser	Arg	Glu	Asp	Asn	
2525						2530					2535				
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Phe	Phe	Asp	Val	Gly	Gly	His	Ser	Leu	Leu	Leu	Ala	Gln	Val	Cys	
2540						2545					2550				
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2570						2575					2580				
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2585						2590					2595				
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Ala	Thr	Glu	Arg	Ala	Leu	Leu	Gln	Gln	Gln	Ala	Ala	Gln	Arg	Arg	
2600						2605					2610				

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 Leu Ala Pro Glu Gln Arg Glu Leu Leu Ala Ala Leu Met Lys Glu 2650
 cag ggc ctg gac gag ggc gca ttg ctg atg ccc gtg gag cgc aag 18527
 Gln Gly Leu Asp Glu Gly Ala Leu Leu Met Pro Val Glu Arg Lys 2665
 ccc gag ggg ctg ccg ctc tcg tcc gcc cag cag cgc atg tgg ttc 18572
 Pro Glu Gly Leu Pro Leu Ser Ser Ala Gln Gln Arg Met Trp Phe 2680
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 Leu Gln Gln Leu Arg Pro Thr Ser Pro Phe Tyr Asn Val His Ala 2695
 gcg ctc cgg ctc acg gga aag ctg aag gtg gag tgc ctg gtg cac 18662
 Ala Leu Arg Leu Thr Gly Lys Leu Lys Val Glu Cys Leu Val His 2710

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Ser Leu Asn Glu Phe	Val Arg Arg His Glu	Pro Leu Arg Thr Val	
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Phe Pro Ser Ala Gly	Gly Gln Pro Leu Gln	Arg Ile Leu Ala Pro	
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gca cgc gct gcg ctc	gag cag cgc gac ctg	agc ggc gtg ccc gcc	18797
Ala Pro Ala Ala Leu	Glu Gln Arg Asp Leu	Ser Gly Val Pro Ala	
2745	2750	2755	
cag gag cga gag gcc	gag gtg tac cgc gcg	gtg gag cac gca gcg	18842
Gln Glu Arg Glu Ala	Glu Val Tyr Arg Ala	Val Glu His Ala Ala	
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ctc gcc tcc ttt gat	ctg gag cga gag ccg	ccg tgc cgc ttc ctc	18887
Leu Ala Ser Phe Asp	Leu Glu Arg Glu Pro	Pro Cys Arg Phe Leu	
2775	2780	2785	
ctg gtg cga gtg gag	ccg gag gaa cac gtg	ctg gtg ttc gcc acg	18932
Leu Val Arg Val Glu	Pro Glu Glu His Val	Leu Val Phe Ala Thr	
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cac cac atc gca gcg	gat ggc tgg tcg ctc	ggc gtc ttc gtg cag	18977
His His Ile Ala Ala	Asp Gly Trp Ser Leu	Gly Val Phe Val Gln	
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Glu Leu Cys Ala Leu	Tyr Thr Ala Ala Val	His Ala Glu Pro Pro	
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Ala Leu Pro Pro Leu	Arg Leu Gln Tyr Ala	Asp Phe Ala Ala Trp	
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Glu Arg Ser Arg Leu	Lys Gly Gly Arg Glu	Arg Glu Leu Leu Glu	
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tac tgg cag gag cag	ctg gca ggg ctg ccg	gac ctg agc acc ctg	19157
Tyr Trp Gln Glu Gln	Leu Ala Gly Leu Pro	Asp Leu Ser Thr Leu	
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ccg cca gag cgg ccc	agg ccc ccg ctg tcc	aag cag gag ggc gcc	19202
Pro Pro Glu Arg Pro	Arg Pro Pro Leu Ser	Lys Gln Glu Gly Ala	
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Thr Phe Glu Phe Ala	Leu Pro Pro His Gln	Val Gln Ala Leu Arg	
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Ser Leu Ala Gln Ala	Arg Arg Thr Ser Leu	Phe Ser Val Leu Leu	
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gcc gcc ttc caa tgg	ctg ctg gcc cgg tgc	gcc ggc cag gac gac	19337
Ala Ala Phe Gln Trp	Leu Leu Ala Arg Cys	Ala Gly Gln Asp Asp	
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Val Ala Leu Gly Met	Pro Ile Ala Asn Arg	Asn Arg Lys Glu Leu	
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Glu Gly Leu Ile Gly	Cys Phe Ala Ser Thr	Leu Val Leu Arg Ala	
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Lys Pro Ser Ala Ser	Thr Ala Phe Thr Ser	Trp Leu Ala Gln Val	
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Ser Glu Gln Leu His	Gly Ala Leu Glu His	Gln Glu Val Pro Phe	
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Glu Arg Leu Val Glu	Val Leu Gln Pro Arg	Arg Arg Met Asp Arg	
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His Pro Leu Phe Gln	Ile Phe Leu Ala Met	Gln Gln His Pro Leu	
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Arg Arg Ala Glu Leu	Pro Gly Leu Leu Leu	Ser Glu Phe Pro Leu	
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Ser Ala Gln Gly Val	Glu Gly Thr Leu Ile	Tyr Asp Val Asp Leu	
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tat ggc cag gag ggc	gta gcg caa ctg gtg	cgg cgc tac gtg agc	19787
Tyr Gly Gln Glu Gly	Val Ala Gln Leu Val	Arg Arg Tyr Val Ser	
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Leu Leu Glu Ala Val	Ala Ala Asp Pro Thr	Arg Thr Leu Gly Glu	
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Leu Ala Gly Glu Thr	Leu Ala Pro Pro Val	Arg Lys Gln Val Leu	
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gcc ctg tcg gag tgt	ccg ccc ctc cca cgc	ccg agc aca gcc cct	19922
Ala Leu Ser Glu Cys	Pro Pro Leu Pro Arg	Pro Ser Thr Ala Pro	
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Arg Thr Leu Ala Glu	Ala Leu Leu Gln Thr	Ala Glu Arg Phe Pro	
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acg gcc acg gtc agc	ttc gtc cag gca cag	ggc tct tgc acg gcc	20012
Thr Ala Thr Val Ser	Phe Val Gln Ala Gln	Gly Ser Cys Thr Ala	
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Trp Thr Leu Pro Glu	Leu Val Glu Arg Ala	Arg Arg Leu Gln Ala	
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Gly Leu Arg Gln Trp	Gly Leu Arg Pro Gly	Asp Ser Leu Val Leu	

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3180	3185	3190	
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aga gcg gag gcg agt Arg Ala Glu Ala Ser 3225	ccc gcg ctc tca cgt Pro Ala Leu Ser Arg 3230	ctg cgg cat gcc ccg Leu Arg His Ala Arg 3235	20237
cag ctg ctg ggt ggg Gln Leu Leu Gly Gly 3240	ccc ccg gtc ctc acc Pro Arg Val Leu Thr 3245	ccg cag gag atg ctg Arg Gln Glu Met Leu 3250	20282
ccc gat ctt gcc agg Pro Asp Leu Ala Arg 3255	cag ctt cag gtc tcg Gln Leu Gln Val Ser 3260	ccc acc gcc gac atc Pro Thr Ala Asp Ile 3265	20327
ctg ggg gcc gtg gag Leu Gly Ala Val Glu 3270	gag ctg aga gcc acg Glu Leu Arg Ala Thr 3275	ggt ggc gag gcg ccc Gly Gly Glu Ala Pro 3280	20372
ctg ccc cca ggg cgc Leu Pro Pro Gly Arg 3285	atg gat gac gtg gcc Met Asp Asp Val Ala 3290	ctg ctc aac ctc acc Leu Leu Asn Leu Thr 3295	20417
tcg ggc acc acc ggc Ser Gly Thr Thr Gly 3300	aag gcc aag tgc gcc Lys Ala Lys Cys Ala 3305	atg ctc acg cac cgc Met Leu Thr His Arg 3310	20462
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ggc gcc ctg tcc gag Gly Ala Leu Ser Glu 3345	tac cac ctc cgc ccg Tyr His Leu Arg Pro 3350	ctc tgc gcc ggc atg Leu Cys Ala Gly Met 3355	20597
cac acc ttc cac gct His Thr Phe His Ala 3360	ccc acc gag gag gtg Pro Thr Glu Glu Val 3365	ctc gcc gag ccc ctg Leu Ala Glu Pro Leu 3370	20642
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trg gag gac ccg cgc val Glu Asp Arg Arg 3405	tgg agc ctg gga ggc Trp Ser Leu Gly Gly 3410	gtg cgc gtg ctg ctc Val Arg Val Leu Leu 3415	20777
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Arg Pro Gly Thr Pro	Pro Arg Met His Thr	Leu Glu Arg Ala Ser	
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Leu Ala Pro Gln Pro	Pro Ala Ser Leu Leu	Ser Arg Ile Arg Gln	
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Gln Val Leu Glu Gln	Val Gly Val Arg Ile	Asp His Leu Ile Pro	
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Pro Gln Pro Ala Pro	Val Pro Ser Pro Ser	Arg Pro Leu Glu Gln	
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Ala Pro Glu Ala Ser	Phe Phe Asp Leu Gly	Gly Asn Ser Ile Leu	
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Leu Val Arg Val Glu	Arg Ala Leu Arg Ala	Arg Leu Gly Leu Glu	
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Leu Thr Leu Met Asp	Leu Phe Ala Tyr Pro	Thr Val His Ser Leu	
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gac tag			21953
Asp			

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<211> 2625

<212> PRT

<213> Angiococcus disciformis

<400> 34

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20	25	30		

Met Thr Pro Glu Leu Gln Ser Arg Leu Gly Gly Ala Arg His Glu Leu
 35 40 45

Ile Ala Leu Leu Arg Gln Leu Gln Pro Ser Ser Gln Gly Gly Ser Leu
 50 55 60

Leu Ala Pro Val Ala Arg Asn Gly Arg Leu Ala Leu Ser Phe Ala Gln
 65 70 75 80

Gln Arg Leu Trp Phe Gln Glu Gln Leu His Pro Glu Ala Pro Ala Asn
 85 90 95

Asn Leu Thr Gly Ala Val Val Phe Thr Gly Pro Leu His Val Ala Ala
 100 105 110

Leu Leu Gly Ala Val Ala Ala Leu Val Arg Arg His Glu Ala Leu Arg
 115 120 125,

Thr Thr Leu Gly Glu Glu Gly Gly Val Pro Tyr Ser Leu Ile Gly Glu
 130 135 140

Pro Trp Gln Pro Ala Leu Glu Val Glu Ala Leu Pro Gly Ala Thr Val
 145 150 155 160

Gly Glu Arg Leu Glu Gln Ala Arg Glu Val Ala Leu Ala Glu Ser Arg
 165 170 175

Arg Arg Phe Ala Leu Glu Thr Glu Pro His Leu Arg Val Arg Leu Leu
 180 185 190

Arg Leu Ala Glu Gln Gln His Val Leu Val Leu Ser Leu His His Ile
 195 200 205

Ala Ala Asp Gly Val Gly Leu Gln Val Leu Glu Gln Glu Leu Ala Ala
 210 215 220

Leu Tyr Gly Ala Leu Ser Ala Gly Ala Glu Pro Arg Leu Pro Pro Leu
 225 230 235 240

Pro Leu Gln Val Ala Asp Leu Ala Asp Trp Gln Arg Arg Trp Val Glu
 245 250 255

Gly Glu Glu Tyr Gln Val Gln Leu Ala Tyr Trp Arg Arg Gln Leu Ala
 260 265 270

Gly Leu Thr Pro Leu Glu Val Pro Gly Asp His Pro Arg Pro Arg Ile

275

280

285

Pro Ser Met Arg Gly Ala Glu Val Arg Ala Pro Leu Leu Ser Ala Pro
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Gln Ala Gln Val Leu Arg Ala Leu Gly Gln Gly Glu Gly Ala Thr Leu
305 310 315 320

Tyr Met Thr Leu Leu Ala Ala Leu Gly Val Leu Leu Gln Arg Trp Thr
325 330 335

Gly Gln His Asp Met Ala Val Gly Ser Ala Ala Ala Asn Arg Asn Arg
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Pro Gly Leu Glu Gly Ile Leu Gly Phe Leu Leu Asn Ile Val Leu Leu
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370 375 380

Ala Arg Arg Val Cys Val Glu Ala Tyr Ala His Gln Glu Leu Pro Phe
385 390 395 400

Glu His Leu Val Glu Ala Leu Gln Pro Gly Ser Glu Arg Gly Asp Ser
405 410 415

Ser Leu Tyr Arg Val Ala Leu Ala Val Ser Asp Thr Pro Trp Met Pro
420 425 430

Gly His Gly Leu Lys Leu Glu Gly Val Gln Ala Gln Pro Leu Asp Phe
435 440 445

Pro Arg Gly Val Leu Asp Leu Asp Leu His Leu Trp Val Tyr Asp Thr
450 455 460

Gly Glu Gly Leu Thr Gly Arg Leu Glu Tyr Ala Val Asp Leu Tyr Glu
465 470 475 480

Glu Pro Thr Ala Arg Arg Leu Leu Glu Gly Phe Arg Gln Val Leu Glu
485 490 495

Ala Val Val Glu Ala Pro Asp Arg Pro Val Pro Glu Leu Pro Val Leu
500 505 510

Gly Glu Gln Glu Arg His Gln Val Leu Ser Gly Trp Asn Arg Thr Gln
515 520 525

Arg Pro Tyr Pro Arg Glu Ala Ser Val His Gly Leu Phe Gln Gln Arg
530 535 540

Ala Leu Gln Ala Pro Arg Ala Val Ala Val Val Tyr Gly Glu Arg Ser
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Leu Thr Tyr Gly Glu Leu Ala Glu Arg Ala Arg Gly Leu Ala Gln Gly
565 570 575

Leu Val Ala Arg Gly Val Arg Arg Gly Asp Leu Val Ala Leu Arg Leu
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Glu Arg Ser Pro Glu Gln Val Glu Ser Met Leu Ala Val Leu Gln Ala
595 600 605

Gly Ala Ala Tyr Val Pro Leu Asp Pro Ser Tyr Pro Val Gln Arg Gln
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Glu Phe Met Leu Gln Asp Ser Gly Ala Arg Leu Leu Val His Ser Gly
625 630 635 640

Pro Leu Pro Phe Ala Pro Gln Gly Cys Ala Thr Leu Asp Leu Gln Ala
645 650 655

Trp His Pro Ala Pro Ser Asp Gly Gly Glu Pro Leu Pro Gln Cys Ser
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Gly Glu Asp Leu Ala Tyr Val Ile Tyr Thr Ser Gly Ser Thr Gly Gln
675 680 685

Pro Lys Gly Val Ala Val Cys His Arg Ala Met Thr Arg Leu Val Cys
690 695 700

Asn Thr Asp Tyr Val Gln Leu Gly Pro Glu Asp Arg Val Ala Gln Ala
705 710 715 720

Ser Asn Ala Ser Phe Asp Ala Ala Thr Phe Glu Val Trp Gly Ala Leu
725 730 735

Leu Asn Gly Ala Arg Leu Val Gly Leu Ala Thr Glu Glu Ala Ile Gln
740 745 750

Ala Arg Arg Leu Ala Glu Val Leu Arg Glu Gln Arg Ile Ser Val Leu
755 760 765

Phe Val Thr Thr Ala Leu Phe Asn His Val Ala Arg Glu Gln Pro Gln
770 775 780

Ala Phe Ser Thr Leu Arg Tyr Leu Leu Phe Gly Gly Glu Ala Val Asp
 785 790 795 800

Ala Ser Ser Val Arg Arg Val Leu Lys Gln Gly Ala Pro Gly His Leu
 805 810 815

Leu His Val Tyr Gly Pro Thr Glu Asn Thr Thr Phe Ser Thr Ala Trp
 820 825 830

Arg Val Glu His Leu Ala Glu Gln Ala His Thr Val Pro Met Gly His
 835 840 845

Pro Ile Ala Asn Ser Arg Leu His Val Leu Asp Glu Ala Leu Gln Pro
 850 855 860

Val Pro Val Gly Ala Met Gly Glu Val Tyr Leu Gly Gly Asp Gly Leu
 865 870 875 880

Ala Leu Gly Tyr Trp Arg His Pro Glu Ala Thr Ala Glu Arg Phe Val
 885 890 895

Pro Asp Pro His Gly Leu Glu Pro Gly Gly Arg Leu Tyr Arg Thr Gly
 900 905 910

Asp Leu Ala Arg Arg Gln Ala Asp Gly Ala Val Val Phe Ala Gly Arg
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Val Asp Arg Gln Val Lys Leu Arg Gly Phe Arg Val Glu Pro Ala Glu
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Ile Glu Ser His Leu Cys Glu His Ser Glu Val Ser Ala Ala Val Val
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Glu Leu Arg Gly Glu Gly Ala Leu Arg Arg Leu Val Ala Tyr Val Val
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Pro Arg Ala Gly Gly Arg Pro Gly Ala Glu Glu Leu Arg Thr Phe Leu
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Arg Thr Arg Leu Pro Glu Tyr Met Leu Pro Ala Ser Phe Ser Leu Leu
 995 1000 1005

Glu Ala Leu Pro Leu Thr Pro Asn Gly Lys Val Asp Arg Ser Ala
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Leu Pro Glu Ser Phe Glu Glu Ala Ser Arg Glu Gln Ala Pro Val
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Val 1040	Pro	Pro Arg Gly Pro	Val 1045	Glu Ala Leu Leu	Val 1050	Asp Ile Trp
Arg 1055	Glu	Val Leu Gly Thr	Gln 1060	Arg Val Ser Val	His 1065	Asp Asp Phe
Phe 1070	Asp	Leu Gly Gly His	Ser 1075	Leu Leu Ala Thr	Arg 1080	Val Val Ser
Arg 1085	Leu	Arg Glu Ala Leu	Gln 1090	Val Glu Leu Pro	Leu 1095	Arg Thr Leu
Phe 1100	Glu	Ala Pro Gln Leu	Ser 1105	Ala Leu Ala Ala	Gln 1110	Val Glu Val
Leu 1115	Leu	Gly His Arg Gln	Leu 1120	Arg Pro Pro Pro	Leu 1125	Val Pro Ala
Val 1130	Arg	Pro Pro Glu Leu	Pro 1135	Leu Ser Phe Ala	Gln 1140	Gln Arg Leu
Trp 1145	Phe	Leu Gln Gln Leu	Ala 1150	Pro Gln Ser Thr	Ala 1155	Tyr Gln Ile
Leu 1160	Asp	Ala Trp His Val	Arg 1165	Gly Arg Val Asp	Val 1170	Gly Ala Leu
Glu 1175	Arg	Ala Leu Glu Gln	Leu 1180	Val Arg Arg His	Glu 1185	Ala Leu Arg
Thr 1190	Thr	Phe Glu Pro Gly	Gly 1195	Asp Gly Val Pro	Arg 1200	Gln Arg Ile
His 1205	Ala	Pro Ala Pro Val	Pro 1210	Leu Arg Gln Val	Asp 1215	Leu Arg Ser
His 1220	Gly	Ile Ala Ala Arg	Glu 1225	Glu Ala Leu Arg	Trp 1230	Met Arg Glu
Gln 1235	Ala	Leu Arg Pro Leu	Glu 1240	Leu Asp Lys Gly	Pro 1245	Leu Leu Arg
Val 1250	Ser	Leu Leu Arg Leu	Glu 1255	Glu Ala Gln Ser	Leu 1260	Leu Phe Leu
Glu Leu	His His Ile Val Gly	Asp Gly Trp Ser Leu	Ser Val Trp			

1265

1270

1275

Ser Arg Glu Leu Ser His Leu Tyr Glu Ala Ala Leu His Gly Ala
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Glu Pro Gly Leu Ala Pro Leu Pro Val Gln Tyr Ala Asp Phe Ala
1295 1300 1305

Leu Trp Gln Arg Gly Trp Leu Gln Gly Pro Val Leu Arg Glu Glu
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Leu Thr Trp Trp Arg Glu Arg Leu Ala Arg Leu Ala Pro Leu Arg
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Leu Pro Ala Asp His Ala Arg Pro Glu Val Gln Arg Phe Asn Gly
1340 1345 1350

Ala Thr Tyr Arg Phe Thr Leu Pro Gly Val Arg Val Gln Ala Leu
1355 1360 1365

Arg Arg Leu Gly His Glu His Gly Ala Thr Leu Phe Met Val Leu
1370 1375 1380

Leu Ala Gly Phe Asn Ala Leu Leu Ala Arg Tyr Thr Gly Gln Thr
1385 1390 1395

Asp Ile Ala Ile Gly Ala Pro Ile Ala Asn Arg Thr Arg Gly Glu
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Val Glu Gly Leu Ile Gly Phe Phe Val Asn Thr Leu Val Leu Arg
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Thr Arg Leu Glu Gly Asn Pro Ser Phe Leu Glu Leu Leu Arg Arg
1430 1435 1440

Val Arg Glu Thr Thr Leu Glu Ala Tyr Ala His Gln Glu Leu Pro
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Phe Glu Arg Leu Val Glu Glu Leu Gln Pro Glu Arg Gln Ala Asn
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Gln Asn Pro Leu Val Gln Val Leu Leu Ala Leu Gln Asn Ala Pro
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Arg Glu Pro Leu Arg Leu Ala Gly Leu Glu Ala Glu His Leu Glu
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Tyr Leu Val Ala Thr Thr Arg Phe Asp Leu Glu Leu His Leu Trp
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Glu Glu Glu Glu Gly Leu Ser Cys Ile Ala Val Tyr Asp Arg Ala
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Leu Tyr Gly Ala Gly Thr Val Glu Arg Leu Val Gly Ala Trp Cys
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Thr Leu Leu Glu Gly Val Ala Glu Leu Pro Ala Arg Arg Val Ala
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Glu Leu Pro Leu Val Pro Ala Arg Glu Leu Arg Gln Val Pro Pro
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Pro Ser Pro Ala Ala Ala Ile Glu Thr Ser Ile Gly Ala Arg Phe
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Ser Glu Val Ala Arg Arg Gln Pro Gly Ala Thr Ala Val Thr Gln
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Gly Gly Arg His Leu Thr Tyr Ala Glu Leu Glu Glu Arg Ser Glu
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Arg Leu Ala Arg Tyr Leu Ala Trp Leu Gly Val Arg Ala Gly Asp
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Arg Val Gly Leu Ala Thr Glu Arg Thr Leu Glu Arg Ile Ile Ser
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Leu Leu Gly Ile Leu Lys Ala Gly Ala Ala Tyr Val Pro Leu Asp
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Val Arg Gln Pro Ala Arg Arg Leu Ser Leu Leu Val Gln Ala Ala
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Gly Val Arg Thr Val Ile Ala Glu Glu Gln Ala Arg Thr Val Leu
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Ser Gly Leu Gly Gln Pro Leu Thr Leu Val Asp Ala Ala Gln Glu
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Pro Ala Ser Ala Gln Gln Val Pro Ala Leu Gly Pro Glu Arg Ser
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Leu Gly Gly Asp Met Leu Ala Tyr Val Leu Phe Thr Ser Gly Ser
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Thr	Gly	Glu	Pro	Lys	Gly	Val	Cys	Ile	Pro	His	Arg	Ala	Val	Leu
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Glu	Val	Trp	Gly	Ala	Leu	Leu	Asn	Gly	Ala	Arg	Leu	Val	Leu	Val
1790						1795					1800			
Pro	Pro	Glu	Gln	Gln	Ser	Leu	Glu	Ser	Leu	Gly	Gln	Glu	Leu	Ser
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Pro	Thr	Glu	Ser	Cys	Thr	Phe	Thr	Cys	Cys	His	Arg	Val	Gly	Ser
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Pro	Gln	Glu	Leu	Gly	Gly	Ser	Val	Pro	Ile	Gly	Thr	Pro	Ile	Asp
1895						1900					1905			
Leu	Gly	Trp	Val	Ser	Val	Val	Asp	Glu	Arg	Leu	Gln	Pro	Val	Pro
1910						1915					1920			
Asp	Gly	Ala	Pro	Gly	Glu	Leu	Leu	Val	Gly	Gly	Pro	Gly	Leu	Ala
1925						1930					1935			
Trp	Gly	Tyr	Leu	Gln	His	Pro	Glu	Leu	Thr	Ala	Glu	Arg	Phe	Ile
1940						1945					1950			
Pro	Asp	Pro	Leu	Ser	Arg	Thr	Pro	Gly	Ala	Arg	Val	Tyr	Arg	Thr
1955						1960					1965			
Gly	Asp	Leu	Val	Arg	Arg	Arg	Glu	Asp	Gly	Thr	Leu	Glu	Phe	Leu
1970						1975					1980			

Gly	Arg	Val	Asp	His	Gln	Leu	Lys	Val	Arg	Gly	Phe	Arg	Ile	Glu
1985						1990					1995			
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2000						2005					2010			
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2015						2020					2025			
Val	Cys	Tyr	Ala	Val	Pro	Arg	Val	Glu	Ser	Ser	Glu	Gln	Gly	Ser
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Ala	Asp	Glu	Trp	Ser	Gly	Val	Ala	Ala	Gly	Ser	Phe	Asp	Ala	Val
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Arg	Gln	Val	Leu	Ala	Arg	Cys	Val	Glu	Ala	Val	Glu	Asp	Gly	Gly
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2210

2215

2220

Phe His Ala Ser Val Glu Leu Glu Arg Ala Ala Pro Ser Met Pro
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Leu Glu Ala Trp Arg Glu Arg Val Arg Arg Ala Val Leu Glu Asp
 2240 2245 2250

Asn Glu Leu Val Val Asp Pro Ala Leu Phe Val Ala Leu Ala His
 2255 2260 2265

Gln His Pro Arg Val Ser His Val Asp Ile Glu Leu Thr Arg Gly
 2270 2275 2280

Thr His Pro Asn Glu Met Ala Arg Phe Arg Tyr Asn Ala Val Leu
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His Ile Gly Pro Arg Thr Pro Pro Pro Ala Ser Glu Val Pro Trp
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Val Asp Trp Ser Thr Gln Gly Leu Ser Leu Asp Ala Leu Arg Ala
 2315 2320 2325

Arg Leu Arg Gln Gly Pro Pro Gly Pro Leu Gly Val Ala Gly Ile
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Pro Asn Ala Arg Val Leu Pro Ala Val Arg Ala Ala Glu Ala Leu
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Gly Ser Thr Gly Ser Ala Arg Arg Val Glu Glu Leu Arg Arg Arg
 2360 2365 2370

Leu Ser Gln Pro Gly Thr Gly Ala Gln Asp Pro Asp Pro Phe Trp
 2375 2380 2385

Gln Leu Ala Glu Ser Leu Gly Tyr Thr Ala Ala Val Ser Trp Ser
 2390 2395 2400

Pro Gly Arg Arg Asp Gly Ala Phe Asp Val Leu Phe Leu Pro Ala
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Thr Pro Gly Met His Pro Arg Trp Leu Gly Pro Thr Pro Leu Asn
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Asp Thr Pro Pro Pro Ala Ser Ala Arg Leu Ser Ser Glu Pro Arg
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Arg Ala Ser Leu Ser Leu Arg Leu Gly Ser Ala Leu Arg Ala His
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Leu Gln Thr His Leu Pro Asp Phe Met Val Pro Ser Arg Phe Val
2465 2470 2475

Val Leu Gln Ser Leu Pro Leu Thr Pro Asn Gly Lys Val Asp Arg
2480 2485 2490

Ala Ala Leu Pro Val Pro Asp Ser Arg Arg Leu Glu Ser Ala Pro
2495 2500 2505

Leu Val Pro Pro Ser Asn Glu Leu Glu Arg Val Leu Ala Gln Val
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Trp Lys Glu Val Leu Gly Leu Glu Glu Val Ser Arg Glu Asp Asn
2525 2530 2535

Phe Phe Asp Val Gly Gly His Ser Leu Leu Leu Ala Gln Val Cys
2540 2545 2550

Ser Arg Leu Glu Ala Arg Leu Gly Arg Arg Leu Glu Leu Val Thr
2555 2560 2565

Leu Phe Arg Tyr Ser Ser Ile Ala Ala Leu Ala Glu His Leu Gln
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Ala Pro Gln Glu Leu Ala Ala Ala Glu Ala Gln Val Gln Arg Met
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Ala Gln Gln Arg Met Trp Phe Leu Gln Gln Leu Arg Pro Thr Ser Pro
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Phe Tyr Asn Val His Ala Ala Leu Arg Leu Thr Gly Lys Leu Lys Val
65 70 75 80

Glu Cys Leu Val His Ser Leu Asn Glu Phe Val Arg Arg His Glu Pro
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Leu Arg Thr Val Phe Pro Ser Ala Gly Gly Gln Pro Leu Gln Arg Ile
100 105 110

Leu Ala Pro Ala Pro Ala Ala Leu Glu Gln Arg Asp Leu Ser Gly Val
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Pro Ala Gln Glu Arg Glu Ala Glu Val Tyr Arg Ala Val Glu His Ala
130 135 140

Ala Leu Ala Ser Phe Asp Leu Glu Arg Glu Pro Pro Cys Arg Phe Leu
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Leu Val Arg Val Glu Pro Glu Glu His Val Leu Val Phe Ala Thr His
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His Ile Ala Ala Asp Gly Trp Ser Leu Gly Val Phe Val Gln Glu Leu
180 185 190

Cys Ala Leu Tyr Thr Ala Ala Val His Ala Glu Pro Pro Ala Leu Pro
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Pro Leu Arg Leu Gln Tyr Ala Asp Phe Ala Ala Trp Glu Arg Ser Arg
210 215 220

Leu Lys Gly Gly Arg Glu Arg Glu Leu Leu Glu Tyr Trp Gln Glu Gln
225 230 235 240

Leu Ala Gly Leu Pro Asp Leu Ser Thr Leu Pro Pro Glu Arg Pro Arg
245 250 255

Pro Pro Leu Ser Lys Gln Glu Gly Ala Thr Phe Glu Phe Ala Leu Pro
260 265 270

Pro His Gln Val Gln Ala Leu Arg Ser Leu Ala Gln Ala Arg Arg Thr
275 280 285

Ser Leu Phe Ser Val Leu Leu Ala Ala Phe Gln Trp Leu Leu Ala Arg
290 295 300

Cys Ala Gly Gln Asp Asp Val Ala Leu Gly Met Pro Ile Ala Asn Arg
305 310 315 320

Asn Arg Lys Glu Leu Glu Gly Leu Ile Gly Cys Phe Ala Ser Thr Leu
325 330 335

Val Leu Arg Ala Lys Pro Ser Ala Ser Thr Ala Phe Thr Ser Trp Leu
340 345 350

Ala Gln Val Ser Glu Gln Leu His Gly Ala Leu Glu His Gln Glu Val
355 360 365

Pro Phe Glu Arg Leu Val Glu Val Leu Gln Pro Arg Arg Arg Met Asp
370 375 380

Arg His Pro Leu Phe Gln Ile Phe Leu Ala Met Gln Gln His Pro Leu
385 390 395 400

Arg Arg Ala Glu Leu Pro Gly Leu Leu Leu Ser Glu Phe Pro Leu Arg
405 410 415

Ser Arg Val Ala Arg Phe Asp Leu Glu Phe His Leu Trp Glu Ser Ala
420 425 430

Gln Gly Val Glu Gly Thr Leu Ile Tyr Asp Val Asp Leu Tyr Gly Gln
435 440 445

Glu Gly Val Ala Gln Leu Val Arg Arg Tyr Val Ser Leu Leu Glu Ala
450 455 460

Val Ala Ala Asp Pro Thr Arg Thr Leu Gly Glu Leu Ala Gly Glu Thr
465 470 475 480

Leu Ala Pro Pro Val Arg Lys Gln Val Leu Ala Leu Ser Glu Cys Pro
485 490 495

Pro Leu Pro Arg Pro Ser Thr Ala Pro Arg Thr Leu Ala Glu Ala Leu
500 505 510

Leu Gln Thr Ala Glu Arg Phe Pro Thr Ala Thr Val Ser Phe Val Gln

515

520

525

Ala Gln Gly Ser Cys Thr Ala Trp Thr Leu Pro Glu Leu Val Glu Arg
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Ala Arg Arg Leu Gln Ala Gly Leu Arg Gln Trp Gly Leu Arg Pro Gly
545 550 555 560

Asp Ser Leu Val Leu Val Leu Gly Arg Glu Glu Glu Thr Val Glu Ala
565 570 575

Leu Trp Ala Cys Val Leu Ala Gly Val Ala Pro Leu Val Leu Pro Ala
580 585 590

Pro Pro Ala Arg Ala Glu Ala Ser Pro Ala Leu Ser Arg Leu Arg His
595 600 605

Ala Arg Gln Leu Leu Gly Gly Pro Arg Val Leu Thr Arg Gln Glu Met
610 615 620

Leu Pro Asp Leu Ala Arg Gln Leu Gln Val Ser Pro Thr Ala Asp Ile
625 630 635 640

Leu Gly Ala Val Glu Glu Leu Arg Ala Thr Gly Gly Glu Ala Pro Leu
645 650 655

Pro Pro Gly Arg Met Asp Asp Val Ala Leu Leu Asn Leu Thr Ser Gly
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Thr Thr Gly Lys Ala Lys Cys Ala Met Leu Thr His Arg Asn Leu Leu
675 680 685

Val Arg Leu Glu Ala Thr Asn Val Val Tyr Glu Ser Gln Pro Leu Glu
690 695 700

Arg Gly Leu Val Trp Leu Gln Leu His Asn Ile Gly Ala Leu Ser Glu
705 710 715 720

Tyr His Leu Arg Pro Leu Cys Ala Gly Met His Thr Phe His Ala Pro
725 730 735

Thr Glu Glu Val Leu Ala Glu Pro Leu Arg Trp Leu Glu Trp Leu Glu
740 745 750

Arg Tyr Gly Ile Ala Gln Thr Trp Ala Pro Ser Phe Ala Tyr Ser His
755 760 765

Leu Leu Glu Arg Leu Arg Lys Val Glu Asp Arg Arg Trp Ser Leu Gly
770 775 780

Gly Val Arg Val Leu Leu Ser Ala Gly Glu Gln Ile Ser Ala Pro Met
785 790 795 800

Val Glu Glu Leu Met Arg Arg Leu Ala Pro Ser Gly Val Arg Glu Asp
805 810 815

Ala Phe Val Ala Ala Trp Gly Met Thr Glu Thr Ala Ser Gly Val Thr
820 825 830

Tyr Ala Arg Arg Pro Gly Thr Pro Pro Arg Met His Thr Leu Glu Arg
835 840 845

Ala Ser Leu Ser Gly Pro Leu Arg His Ala Ala Pro Ala Ser Pro Thr
850 855 860

Ala Leu Arg Leu Met Asp Val Gly Ala Pro Ile Ala Gly Thr Ala Leu
865 870 875 880

Arg Val Val Asp Ala Ser Gly Glu Leu Leu Ser Glu Glu Cys Val Gly
885 890 895

Arg Ile Gln Val Arg Gly Glu Met Ile Ser Pro Gly Tyr Tyr Gly Asp
900 905 910

Pro Lys Ala Ser Ala Ala Leu Leu Thr Ala Asp Gly Trp Leu Glu Thr
915 920 925

Gly Asp Leu Gly Phe Leu Ser Glu Gly Ala Leu Thr Ile Thr Gly Arg
930 935 940

Ala Lys Asp Leu Val Ile Ile His Gly Thr Asn Phe Ser Cys Tyr Glu
945 950 955 960

Ile Glu Ser Ala Val Glu Gln Val Glu Gly Val Ala Pro Ser Ser Ala
965 970 975

Ala Ala Ala Ala Val Arg Met Leu Glu Gly Ser Arg Glu Glu Leu Ala
980 985 990

Val Phe Phe Val Pro Thr Glu Gly Leu Ala Pro Gln Pro Pro Ala Ser
995 1000 1005

Leu Leu Ser Arg Ile Arg Gln Gln Val Leu Glu Gln Val Gly Val
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Arg Ile Asp His Leu Ile Pro Leu Glu Pro His Gln Leu Pro Arg
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Thr Glu Gly Gly Lys Leu Arg Arg Ser Glu Leu Arg Ala Arg Phe
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Glu Ala Gly Glu Leu Arg Ala Pro Gln Pro Ala Pro Val Pro Ser
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Pro Ser Arg Pro Leu Glu Gln Leu Ile Ala Ser Val Trp Ala Glu
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Val Leu Glu His Gln Asp Ile Ala Pro Glu Ala Ser Phe Phe Asp
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Leu Gly Gly Asn Ser Ile Leu Leu Val Arg Val Glu Arg Ala Leu
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Arg Ala Arg Leu Gly Leu Glu Leu Thr Leu Met Asp Leu Phe Ala
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Pro Met Pro His Val Pro Gly Leu Leu Leu Val Leu Leu Ser Met Ala
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Val Arg Leu Asp Ala Pro Ala Arg Val Lys Ile Leu Ser Thr Gly Glu
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Leu Arg Val Pro Phe Leu Thr Glu Pro Ser Leu Ala Glu Pro Ala Phe
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cag ctc gtc acg gct tcg gac gtg gcg gat tcg cag gtg atg gtc tac      439
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ggc acg ggc ggc att gag gca acg tcc gtt cgc cgc ttc ctg gcg gat Gly Thr Ala Gly Ile Glu Ala Thr Ser Val Arg Arg Phe Leu Ala Asp 200 205 210	679
aag tgg gcg gtg ctc caa gtg caa gtg agg aac ggc tct ggg cag cct Lys Trp Ala Val Leu Gln Val Gln Val Arg Asn Gly Ser Gly Gln Pro 215 220 225	727
tgg cgg cca ggg cgg gca tgg ctg gaa agt gcg gcc acc agg cgc ctc Trp Arg Pro Gly Arg Ala Trp Leu Glu Ser Ala Ala Thr Arg Arg Leu 230 235 240	775
acg gaa gcg cgc acg gtg agc atg gcg ccg gaa gtg ctg gcg ccc gaa Thr Glu Ala Arg Thr Val Ser Met Ala Pro Glu Val Leu Ala Pro Glu 245 250 255 260	823
ggt aag agc cgc gtg gtg gtg gag ttt gcc ggg aag ccc ggg agc aag Gly Lys Ser Arg Val Val Val Glu Phe Ala Gly Lys Pro Gly Ser Lys 265 270 275	871
ggg gaa gtc ttc cga ttg gtg gta gag gac gca gac ggc gtc cgg ccc Gly Glu Val Phe Arg Leu Val Val Glu Asp Ala Asp Gly Val Arg Pro 280 285 290	919
ctc tca gtc gcg ggc gtg gtg atg aag gac aca gcg cag gag aag agc Leu Ser Val Ala Gly Val Val Met Lys Asp Thr Ala Gln Glu Lys Ser 295 300 305	967
ggc cc atg atg acc gtg gat ccc ccc aac ttc ctc aag ccc ggc gcc Gly Met Met Thr Val Asp Pro Pro Asn Phe Leu Lys Pro Gly Ala 310 315 320	1014
cgc ctc ggg gcc ccc tac cgg att cgc ggt tgg aag ggc ggc ggt gcc Arg Leu Gly Ala Pro Tyr Arg Ile Arg Gly Trp Lys Gly Gly Gly Ala 325 330 335	1062
tat ggc gag gtg tac gag tgc gaa agg cag ggc agg ccc tac gcc ctc Tyr Gly Glu Val Tyr Glu Cys Glu Arg Gln Gly Arg Pro Tyr Ala Leu 340 345 350 355	1110
aag ctg tcc aag cac cgc cag tcc agc gat gac ccg ggc aag acg gac Lys Leu Ser Lys His Arg Gln Ser Ser Asp Asp Pro Gly Lys Thr Asp 360 365 370	1158
caa cgg ctg ctg cgg gag ttg gtg tgc ctc gtc caa ctg gac cac ccg Gln Arg Leu Leu Arg Glu Leu Val Cys Leu Val Gln Leu Asp His Pro 375 380 385	1206
aac att gcc aag gtg ctg ggc tgg aca cgc act gac gag ggt tac ggc Asn Ile Ala Lys Val Leu Gly Trp Thr Arg Thr Asp Glu Gly Tyr Gly 390 395 400	1254

tat ctg gtg ctg gag tac atc gag ggg tgg acg ctg gcc caa tgg ctc Tyr Leu Val Leu Glu Tyr Ile Glu Gly Trp Thr Leu Ala Gln Trp Leu 405 410 415	1302
cag caa acg cgc ccc acc gtc gcc caa gtc ctg cac gtc ttc gcc aaa Gln Gln Thr Arg Pro Thr Val Ala Gln Val Leu His Val Phe Ala Lys 420 425 430 435	1350
ctg acg ggg gcg ctc gcg tac atg cac cgc agg ggc gtt cgg cac cgg Leu Thr Gly Ala Leu Ala Tyr Met His Arg Arg Gly Val Arg His Arg 440 445 450	1398
gac gtg tcg ctg tct aac gtc atg gta cgc aag gcg gac ggc gag ccc Asp Val Ser Leu Ser Asn Val Met Val Arg Lys Ala Asp Gly Glu Pro 455 460 465	1446
gtc ctc att gac ctc ggg gcg ggg gac tac tcc ggg gcg cat gag ttg Val Leu Ile Asp Leu Gly Ala Gly Asp Tyr Ser Gly Ala His Glu Leu 470 475 480	1494
acg gac tgg ccc ttg ccc ccg ggc acc gac cgc tac cgc tck ccc gar Thr Asp Trp Pro Leu Pro Pro Gly Thr Asp Arg Tyr Arg Xaa Pro Glu 485 490 495	1542
gcg gcc cgc ttc ctc aag gya cac cag aac gac ccg agc gcc cgg tac Ala Ala Arg Phe Leu Lys Xaa His Gln Asn Asp Pro Ser Ala Arg Tyr 500 505 510 515	1590
gac ttc ccc ccg gaa gat gac ttc tac tcg ctg gcg gtg tgc ctc tat Asp Phe Pro Pro Glu Asp Asp Phe Tyr Ser Leu Ala Val Cys Leu Tyr 520 525 530	1638
gac gcg ctg acg gac gcg gag ccc gcc ctc aag gcg aac gca cgc aag Asp Ala Leu Thr Asp Ala Glu Pro Ala Leu Lys Ala Asn Ala Arg Lys 535 540 545	1686
gcc ccg cgc ctc aac gtc aac agc ccc acc atg gcc ccg ccc ccg gcc Ala Pro Arg Leu Asn Val Asn Ser Pro Thr Met Ala Pro Pro Pro Ala 550 555 560	1734
cgc aag gtc aac ccg cgc gtg ccc gag gta gtg agt gcc tgg gta gag Arg Lys Val Asn Pro Arg Val Pro Glu Val Val Ser Ala Trp Val Glu 565 570 575	1782
cgg tgg ctg gtg cgt gac gtg gaa acc cgg cgg ccc gcg ttg gcc gcc Arg Trp Leu Val Arg Asp Val Glu Thr Arg Arg Pro Ala Leu Ala Ala 580 585 590 595	1830
atg ccc ggc gcg ctg gaa gag ttg gcg aag caa ggc ggc gcg gag tgg Met Pro Gly Ala Leu Glu Glu Leu Ala Lys Gln Gly Gly Ala Glu Trp 600 605 610	1878
ctg gcc acc gtt cag ccc cca ccg gaa gcg ggc acc ccg gcc ccc gag Leu Ala Thr Val Gln Pro Pro Pro Glu Ala Gly Thr Pro Ala Pro Glu 615 620 625	1926
cac cgg ctc tac cgg aag cgg cgg cgc gtg ctg gcg tgg gcc atg gcc His Arg Leu Tyr Arg Lys Arg Arg Arg Val Leu Ala Trp Ala Met Ala 630 635 640	1974
gct ggc gtg ctc gtg gct gtc gcg gcg ctc gcg tgg ctg cgc gct gcc Ala Gly Val Leu Val Ala Val Ala Ala Leu Ala Trp Leu Arg Ala Ala	2022

645

650

655

ccc tct cca gac gcg ccg ccg tcc cag gtc gta ccg gag gca cca agc 2070
Pro Ser Pro Asp Ala Pro Pro Ser Gln Val Val Pro Glu Ala Pro Ser
660 665 670 675

acg ccg cag gcg cca gcc ccg gac agt cca cca acc ccg ccc gtg ccg 2118
Thr Pro Gln Ala Pro Ala Pro Asp Ser Pro Pro Thr Pro Pro Val Pro
680 685 690

tct tcg ggt gca gta ccg gtc ccc atc cca ggt gtc cct gtt gag aag 2166
Ser Ser Gly Ala Val Pro Val Pro Ile Pro Gly Val Pro Val Glu Lys
695 700 705

gaa agc cct ctg tga gtacccccac gaantccgg 2200
Glu Ser Pro Leu
710

<210> 37

<211> 309

<212> PRT

<213> Angiococcus disciformis

<220>

<221> misc_feature

<222> (2195)..(2195)

<223> n=A, C, G or T

<400> 37

Met Arg Leu Arg Pro Met Pro His Val Pro Gly Leu Leu Leu Val Leu
1 5 10 15

Leu Ser Met Ala Ala Trp Ala Ala Glu Ala Gln Thr Ala Pro Gly Pro
20 25 30

Ser Leu Arg Phe Arg Arg Val Pro Leu Thr Gly Lys Pro Glu Val Val
35 40 45

Arg Leu Ala Thr Gly Ile Pro Ala Thr Leu Asn Phe Asp Ala Glu Ile
50 55 60

Asn Pro Gln Lys Val Arg Leu Asp Ala Pro Ala Arg Val Lys Ile Leu
65 70 75 80

Ser Thr Gly Glu Arg Ser Val Thr Leu Leu Ala Glu Gly Asp Leu Gly
85 90 95

Glu Gly Val Thr Leu Arg Val Pro Phe Leu Thr Glu Pro Ser Leu Ala
100 105 110

Glu Pro Ala Phe Gln Leu Val Thr Ala Ser Asp Val Ala Asp Ser Gln
115 120 125

Val Met Val Tyr Arg Ser Ala Asn Ala Pro Glu Leu Met Gln Ala Arg
130 135 140

Leu Thr Glu Leu Glu Ala Arg Ser Ala Ala Cys Glu Ala Gln Leu Ser
145 150 155 160

Thr Glu Arg Glu Arg Ser Glu Ala Thr Gly Pro Ala Ala Trp Val Leu
165 170 175

Ser Arg Gln Val Asp Glu Gly Gly Val Ser Val Val Met Leu Lys Arg
180 185 190

Leu Ser Asp Val Gly Thr Ala Gly Ile Glu Ala Thr Ser Val Arg Arg
195 200 205

Phe Leu Ala Asp Lys Trp Ala Val Leu Gln Val Gln Val Arg Asn Gly
210 215 220

Ser Gly Gln Pro Trp Arg Pro Gly Arg Ala Trp Leu Glu Ser Ala Ala
225 230 235 240

Thr Arg Arg Leu Thr Glu Ala Arg Thr Val Ser Met Ala Pro Glu Val
245 250 255

Leu Ala Pro Glu Gly Lys Ser Arg Val Val Val Glu Phe Ala Gly Lys
260 265 270

Pro Gly Ser Lys Gly Glu Val Phe Arg Leu Val Val Glu Asp Ala Asp
275 280 285

Gly Val Arg Pro Leu Ser Val Ala Gly Val Val Met Lys Asp Thr Ala
290 295 300

Gln Glu Lys Ser Gly
305

<210> 38

<211> 402

<212> PRT

<213> Angiococcus disciformis

<220>

<221> misc_feature

<222> (188)..(188)

<223> The 'Xaa' at location 188 stands for Ser.

<220>

<221> misc_feature

<222> (197)..(197)

<223> The 'Xaa' at location 197 stands for Ala, or Val.

<220>

<221> misc_feature

<222> (2195)..(2195)

<223> n=A, C, G or T

<400> 38

Met Met Thr Val Asp Pro Pro Asn Phe Leu Lys Pro Gly Ala Arg Leu
1 5 10 15

Gly Ala Pro Tyr Arg Ile Arg Gly Trp Lys Gly Gly Gly Ala Tyr Gly
20 25 30

Glu Val Tyr Glu Cys Glu Arg Gln Gly Arg Pro Tyr Ala Leu Lys Leu
35 40 45

Ser Lys His Arg Gln Ser Ser Asp Asp Pro Gly Lys Thr Asp Gln Arg
50 55 60

Leu Leu Arg Glu Leu Val Cys Leu Val Gln Leu Asp His Pro Asn Ile
65 70 75 80

Ala Lys Val Leu Gly Trp Thr Arg Thr Asp Glu Gly Tyr Gly Tyr Leu
85 90 95

Val Leu Glu Tyr Ile Glu Gly Trp Thr Leu Ala Gln Trp Leu Gln Gln
100 105 110

Met Arg Pro Thr Val Ala Gln Val Leu His Val Phe Ala Lys Leu Thr
115 120 125

Gly Ala Leu Ala Tyr Met His Arg Arg Gly Val Arg His Arg Asp Val

130

135

140

Ser Leu Ser Asn Val Met Val Arg Lys Ala Asp Gly Glu Pro Val Leu
145 150 155 160

Ile Asp Leu Gly Ala Gly Asp Tyr Ser Gly Ala His Glu Leu Thr Asp
165 170 175

Trp Pro Leu Pro Pro Gly Thr Asp Arg Tyr Arg Xaa Pro Glu Ala Ala
180 185 190

Arg Phe Leu Lys Xaa His Gln Asn Asp Pro Ser Ala Arg Tyr Asp Phe
195 200 205

Pro Pro Glu Asp Asp Phe Tyr Ser Leu Ala Val Cys Leu Tyr Asp Ala
210 215 220

Leu Thr Asp Ala Glu Pro Ala Leu Lys Ala Asn Ala Arg Lys Ala Pro
225 230 235 240

Arg Leu Asn Val Asn Ser Pro Thr Met Ala Pro Pro Pro Ala Arg Lys
245 250 255

Val Asn Pro Arg Val Pro Glu Val Val Ser Ala Trp Val Glu Arg Trp
260 265 270

Leu Val Arg Asp Val Glu Thr Arg Arg Pro Ala Leu Ala Ala Met Pro
275 280 285

Gly Ala Leu Glu Glu Leu Ala Lys Gln Gly Gly Ala Glu Trp Leu Ala
290 295 300

Thr Val Gln Pro Pro Pro Glu Ala Gly Thr Pro Ala Pro Glu His Arg
305 310 315 320

Leu Tyr Arg Lys Arg Arg Arg Val Leu Ala Trp Ala Met Ala Ala Gly
325 330 335

Val Leu Val Ala Val Ala Ala Leu Ala Trp Leu Arg Ala Ala Pro Ser
340 345 350

Pro Asp Ala Pro Pro Ser Gln Val Val Pro Glu Ala Pro Ser Thr Pro
355 360 365

Gln Ala Pro Ala Pro Asp Ser Pro Pro Thr Pro Pro Val Pro Ser Ser
370 375 380

Gly Ala Val Pro Val Pro Ile Pro Gly Val Pro Val Glu Lys Glu Ser
385 390 395 400

Pro Leu

<210> 39

<211> 21

<212> DNA

<213> artificial sequence

<220>

<223> K-388 primer

<400> 39

tgggaatcat ttgaaggttg g

21

<210> 40

<211> 22

<212> DNA

<213> artificial sequence

<220>

<223> K-389 primer

<400> 40

tgtgtttttc tttgttagac cg

22

<210> 41

<211> 21

<212> DNA

<213> artificial sequence

<220>

<223> ASTIs1A primer

<400> 41

cacccggacc tgcctggatt c

21

<210> 42
<211> 21
<212> DNA
<213> artificial sequence

<220>

<223> ASTIs1B primer

<400> 42
tgctcggctg gcgctactca c

21

<210> 43
<211> 24
<212> DNA
<213> artificial sequence

<220>

<223> ASTIs2A primer

<400> 43
gctcccgggc cacgtggttg aaga

24

<210> 44
<211> 23
<212> DNA
<213> artificial sequence

<220>

<223> ASTIs2B primer

<400> 44
ccgcgggccg tggcagtggg gta

23

<210> 45
<211> 17
<212> DNA
<213> artificial sequence

<220>

<223> TIs-up primer

<400> 45

tggcagccag cccgagc

17

<210> 46

<211> 19

<212> DNA

<213> artificial sequence

<220>

<223> TIs-down primer

<400> 46

ccgcgggtgc cctctcatc

19